



INSTITUTE FOR DEFENSE ANALYSES

Exemplar Practices for Department of Defense Technology Transfer

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Executive Summary

Technology transfer is the process of sharing, transmitting, or conveying technology, data, and information (intellectual property) between government agencies, industry, and academia. The broad goal of this assessment was to identify exemplar practices for technology transfer recommended by Department of Defense (DoD) laboratory staff, DoD Offices of Research and Technology Applications (ORTAs), DoD legal staff, and other stakeholders. The purpose is to inform all personnel at DoD laboratories and technology transfer offices about these practices and encourage their adoption across the DoD.

Literature Review

A review of academic literature, government reports, and legal documents on technology transfer highlighted strategies and factors for success, but not specific practices. The exemplar practices presented in the literature focus on high-level strategies to improve technology transfer at DoD laboratories. These strategies include providing guidance to DoD laboratories to strategically plan and engage in technology transfer; to empower and reward researchers to engage in technology transfer; to create effective and efficient technology transfer offices; to establish processes that streamline executing technology transfer agreements; and to leverage other technology transfer resources at the local, State, and national levels.

The literature identified the following critical factors for a successful technology transfer program: an effective ORTA, engaged researchers, well-managed intellectual property, effective use of technology transfer mechanisms, efficient technology transfer processes, and meaningful interaction with industry through marketing or partnerships.

The literature also highlighted challenges for implementing and encouraging technology transfer at DoD laboratories. For example, the DoD is more focused on technology transition than technology transfer. The goal of technology transition is to spin DoD-developed technologies back into the DoD as products and processes. In addition, many DoD technologies may not be relevant to commercialization in the private sector or may be classified or sensitive. The private sector is concerned with cost *and* performance, while the DoD often weights performance as more important, especially when it comes to weapon systems.

Methodology

Interviews with DoD laboratory ORTA staff and other stakeholders were the primary data-collection method used for this assessment. Using the themes identified in the literature, the research team developed a guide for gathering information on practices and policy recommendations based on semi-structured interviews with technology transfer practitioners, experts, and stakeholders. These interviews were held between June and September 2012.

Programs and processes identified during the discussions were considered exemplar practices for technology transfer at DoD laboratories if they resulted in measurable outputs or outcomes (e.g., reduction in the number of days to execute agreements or increase in the number of agreements); adoption by other laboratories; continued implementation of the exemplar practice; or assignment of dedicated resources.

The research team selected 24 practices (see the table on pages vi–viii) as exemplar and organized them into the following seven categories:

- *Ensuring effective ORTA organization and staffing.* Exemplar practices in this category focus on organizing staff by technology or business area, building strong relationships with DoD attorneys, and providing seed money to ORTAs to pilot programs or software to facilitate technology transfer. For example, Department of Navy Technology Transfer Program Office funds Navy laboratories to conduct pilot projects of new technology transfer approaches. The funding amounts vary from \$5,000 to \$50,000 for each project. Navy laboratories compete for the funding. Examples of the outcomes of these pilot programs include the Innovation Discovery Process and the Military to Market program.
- *Empowering, training, and rewarding scientists and engineers.* Many laboratories are using classroom and online training, boot camps, and presentations by companies and venture capitalists to inform and inspire researchers to file invention disclosures and patent applications or work with companies through Cooperative Research and Development Agreements (CRADAs). For example, a new Defense Acquisition University online course provides training on ensuring that agreements anticipate data rights for future acquisitions. Recognizing and rewarding researchers for their efforts include giving awards and plaques, and sharing royalty payments. Training administrative staff to identify novel technologies (intellectual property), and working with researchers to file invention disclosures is another exemplar.
- *Capturing and managing intellectual property.* Exemplar practices in this category include using Innovation Discovery Process events where inventors discuss their research projects with business and engineering faculty,

entrepreneurs, and industry and technology transfer experts who help identify potential invention disclosures and patents; working with a partnership intermediary to review published peer-reviewed articles to locate marketable technologies that should be disclosed or patented; and using review boards to determine whether to patent technologies from invention disclosures.

- *Using technology transfer mechanisms to full potential.* Exemplar practices include allowing DoD laboratories to license government software, engineering drawings, and other works of technology-related authorship in the absence of patent and copyright protection or with only limited patent coverage and using joint ownership agreements, limited- and special-purpose CRADAs, foreign government CRADAs, and facility CRADAs. These special CRADAs streamline or tailor the CRADA process to allow industry to work with laboratories or use laboratory facilities.
- *Managing and monitoring technology transfer processes.* Examples include setting up systems to track CRADAs and licenses, streamlining the license processes, creating handbooks for agreements, setting up databases and checklists for executing agreements, and using software programs designed to manage intellectual property.
- *Marketing laboratory technologies and capabilities to industry.* These activities include showcasing DoD technologies through technology showcases, training industry about working with DoD laboratories, and preparing and advertising market assessments for technologies that could then be licensed and developed or implemented by companies.
- *Building partnerships.* Examples include using such mechanisms as Educational Partnership Agreements and Partnership Intermediary Agreements and working with local economic development organizations, universities, and venture capital organizations.

Summary and Next Steps

The research team interviewed technology transfer practitioners, experts, and stakeholders to identify exemplar practices. Technology transfer is one of the drivers of innovation in the DoD and the economy. Many DoD technology transfer organizations have implemented creative approaches within the boundaries of existing regulations, directives, and instructions. Encouraging the adoption of these exemplar practices is likely to accelerate the transfer of innovations to the marketplace.

Exemplar Practices for DoD Technology Transfer

Theme	Practice	Description	Criteria for Inclusion	Example Practitioner(s)
Ensuring effective Office of Research and Technology Application (ORTA) organization and staffing	Decentralizing the ORTA organization	Design a decentralized ORTA organized around specific research or industry foci	Continued implementation	Massachusetts Institute of Technology Lincoln Laboratory; Johns Hopkins University Applied Physics Laboratory
	Building relationships between ORTA and general counsel functions	Provide ORTA staff with easy access to and good relationships with attorneys	Continued implementation	Army Armament Research, Development and Engineering Center, Picatinny Arsenal
	Developing grant programs for pilot programs	Provide seed money to ORTA staff for pilot programs or software that may benefit technology transfer	Continued implementation, dedicated resources	Office of Naval Research
Empowering, training, and rewarding researchers	Training researchers about technology transfer	Train scientists and engineers about technology transfer	Continued implementation, adoption by other laboratories	Johns Hopkins University Applied Physics Laboratory
	Recognizing researchers	Recognize researchers via awards	Continued implementation, dedicated resources	Johns Hopkins University Applied Physics Laboratory
		Recognize researchers via larger royalty payments	Continued implementation	Space and Naval Warfare Systems Command, Systems Center Pacific
	Training technology transfer staff about intellectual property issues	Train DoD staff on IP and data rights issues	Continued implementation, adoption by other laboratories	Defense Acquisition University
Capturing and managing intellectual property (IP)	Identifying IP	Use Innovation Discovery Process events where inventors discuss research projects in front of experts who identify IP	Continued implementation, adoption by other laboratories	Naval Surface Warfare Center, Crane Division
		Set up program to examine publications for intellectual property	Continued implementation	Johns Hopkins University Applied Physics Laboratory
		Use TechLink to locate IP in publications	Continued implementation	Air Force Research Laboratory
	Evaluating invention disclosures	Use Review Boards to evaluate IP to determine what to patent	Continued implementation	Aerospace Corporation; Naval Surface Warfare Center, Indian Head Division; Army Medical Research and Materiel Command

Theme	Practice	Description	Criteria for Inclusion	Example Practitioner(s)
Using technology transfer mechanisms to their full potential	Invention licensing agreement	License inventions that have not been patented	Continued implementation	Army Medical Research and Materiel Command
	Joint ownership agreements	Agreement on a strategy for licensing the joint intellectual party to a third party	Continued implementation	Army Research Laboratory
	Limited-purpose and short-form Cooperative Research and Development Agreements (CRADAs)	Use CRADAs for material transfer agreement	Continued implementation	Air Force Research Laboratory, Aerospace Directorate
		Use CRADAs for software use agreement	Continued implementation	Air Force Research Laboratory, Information Directorate
		Use CRADAs for non-disclosure agreement	Continued implementation	Air Force Research Laboratory
	Foreign government CRADAs	Use CRADAs to enter into agreement with foreign government	Continued implementation, adoption by other laboratories	Army Medical Research and Materiel Command
	Facility CRADAs	Use CRADAs that allows DoD contractor to subcontract facility to third parties	Continued implementation	Air Force Applied Neuroscience Branch, 711th Human Performance Wing, Human Effectiveness Directorate
Managing and monitoring technology transfer processes	Changing processes	Standardize processes and procedures to increase efficiency	Measurable outcomes, continued implementation	Army Armament Research, Development and Engineering Center, Picatinny Arsenal
	Tracking CRADAs and licenses	Track licenses and CRADAs	Continued implementation	Space and Naval Warfare Systems Command, Systems Center Pacific
	Streamlining licenses	Edit and cut license agreements	Continued implementation	Army Medical Research and Materiel Command
	Developing handbooks for agreements and contracts	Develop handbook for CRADA partners	Continued implementation	Office of Naval Research
		Develop handbook for licensees	Continued implementation	Aerospace Corporation
	Developing databases and checklists for processes	Develop standard patent royalty distribution processes	Measurable outcomes, continued implementation	Secretary of the Air Force, General Counsel; Air Force Research Laboratory, Partnering Division
		Use software to manage intellectual property	Continued implementation	Naval Research Laboratory
	Checking status of CRADAs	Perform routine status checks on agreements	Continued implementation	Air Force information Operations Center

Theme	Practice	Description	Criteria for Inclusion	Example Practitioner(s)
Marketing laboratory technologies and capabilities to industry	Advertising laboratory technologies	Actively advertise laboratory technologies available for licensing	Continued implementation	Army Medical Research and Materiel Command
	Providing industry training	Brief industry on laboratory technology transfer	Continued implementation	Air Force Aerospace Directorate
	Performing marketing assessments	Perform marketing assessments on laboratory technologies	Measurable outcomes, Continued implementation,	Naval Surface Warfare Center, Crane Division; TechLink
	Conducting technology showcases	Conduct technology showcases where researchers and entrepreneurs can talk	Measurable outcomes, continued implementation	Naval Surface Warfare Center, Indian Head Division
Building partnerships	Using partnership intermediaries to assist in technology transfer type of partnership	Nonprofit Griffiss Institute functions as partnership intermediary, business incubator, and training center	Measurable outcomes, continued implementation, dedicated resources	Air Force Research Laboratory, Information Directorate
	Developing agreements with networks of local and educational partnership intermediaries	Naval Surface Warfare Center, Crane Division, works with partnership network that identifies and markets commercializable technologies	Measurable outcomes, continued implementation,	Naval Surface Warfare Center, Crane Division

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1. Introduction

A. Purpose

The Defense Laboratories Office (DLO) in the Office of the Assistant Secretary of Defense for Research and Engineering asked the Institute for Defense Analyses (IDA) to identify (1) exemplar technology transfer practices throughout the Department of Defense (DoD) laboratory enterprise and (2) technology transfer policy and legislative issues that the Office of the Secretary of Defense (OSD) could address to enhance current practices or lead to new practices.

The impetus for the research was twofold. First, the DLO is interested in technology transfer as it pertains to the DoD's mission "to provide the military forces needed to deter war and to protect the security of our country."¹ To help meet this mission, the DoD laboratory enterprise focuses on transferring technology out of laboratories for commercial development before transitioning it back to the DoD for use by the warfighter. Second, an October 2011 Presidential memorandum identified three actions to be taken by Federal agencies and their associated laboratories: (1) establish goals and measure progress, (2) streamline technology transfer and commercialization processes, and (3) facilitate commercialization through local and regional partnerships (Presidential Memorandum 2011).

This report, one of two resulting from the research, presents exemplar practices to meet these technology transfer objectives as recommended by DoD laboratory staff, DoD Offices of Research and Technology Applications (ORTAs), DoD legal staff, and other stakeholders. The purpose of the report is to inform DoD laboratories and technology transfer offices of these exemplar practices and to encourage their widespread adoption across the DoD. The second report describes policy issues relevant to technology transfer practices at DoD laboratories and is intended for use by OSD policy makers.²

B. Defining Terms

DoD laboratories are operated and managed by the military departments to conduct research and development and support acquisition. Each *laboratory* performs one or more of the following functions: science and technology, engineering development,

¹ From "About the Department of Defense (DOD)," <http://www.defense.gov/about/>.

² S. V. Howieson, S. S. Shipp, G. K. Walejko, et al. *Policy Issues for Department of Defense Technology Transfer*, IDA Paper P-4958, January 2013.

engineering support of deployed materiel and its modernization, and support to acquisition. The term embraces not only laboratories but also research institutes and centers; research, development and engineering centers; and warfare centers of the military departments (adapted from DoD Instruction 3201.01). This includes government-owned, government-operated (GOGO) organizations, Federally Funded Research and Development Centers (FFRDCs), and University Affiliated Research Centers (UARC)s. For the purposes of this report, *DoD laboratory* is used to encompass all three of these governance types.

Technology transfer is the “process of sharing, transmitting, or conveying technology data and information (intellectual property) between the government agencies, industry, and academia” (Gonsalves 2010). Technology transfer occurs *indirectly* through transfer of knowledge via conference presentations, journal articles, seminars, teaching, and other ways of communicating findings. It can also occur through the transfer of technology *directly* to the private sector or by way of *networks* with the goal of commercializing the technology. *Commercial technology transfer* is the transfer of technology from a Federal laboratory or agency to a commercial entity that can improve technologies by undertaking the technical, business, and manufacturing research to bring them to market. This assessment focuses on technology transfer to the commercial sector.

The direct transfer of technologies occurs by licensing inventions and through agreements, such as Cooperative Research and Development Agreements (CRADAs) and Material Transfer Agreements. Technology transfers to the private sector can also occur through the use of network mechanisms, such as partnership intermediaries. Partnership intermediaries are organizations that are funded by Congress, the DoD, or State and local governments to facilitate laboratory and company interactions with the goal to transfer technologies to the private sector. These and other network mechanisms are listed in Table 1 by their type of pathway—direct, indirect, or network.

Many technologies developed by DoD laboratories are dual use. *Dual-use technologies* refer to technologies, products, or families of products that have both commercial and Federal Government applications.

Table 1. Technology Transfer Mechanisms by Type of Pathway

Indirect Pathway Mechanisms	Direct Pathway Mechanisms	Network Pathway Mechanisms
Conference Papers	<i>Invention Protection</i>	Commercialization Assistance Program
Education Partnership Agreements	Invention disclosures	Entrepreneurship-in-residence programs
Field Days	Patent applications	Entrepreneurship Training
Intramural Research Training	Issued patents	Mentor-Protégé Program
Awards	<i>Transfer of Property</i>	Personnel Exchange Agreements
Publications	Material Transfer Agreements	Partnership Intermediary Agreements
Seminars	Patent licenses	Venture Capital Forums
Teaching	Inter-Institutional Agreements	
Workshops	<i>Collaborative Research Agreements</i>	
	Cooperative Research and Development Agreements (CRADAs)	
	Space Act Agreements	
	Collaboration Agreements (other than CRADAs)	
	<i>Resource Use Agreements</i>	
	Commercial Test Agreements	
	Test Service Agreements	
	User Facility Agreements	
	Work for Others	

Source: Hughes et al. (2011), adapted from Ruegg (2000) and Federal Laboratory Consortium for Technology Transfer (2009).

C. Approach

The IDA research team reviewed the literature as well as findings related to DoD laboratories in previous IDA Science and Technology Policy Institute research on technology transfer (Hughes et al. 2011). The team then interviewed stakeholders that included representatives from DoD ORTAs, legal staff involved in DoD technology transfer, staff at partnership intermediaries, DoD laboratory researchers, and others involved in the technology transfer or acquisition processes at the DoD and other agencies.

The information from the interviews was categorized into exemplar practices (the subject of this report) or policy recommendations (the subject of the second report). To be included in this report as an exemplar practice, a recommended practice had to lead to improved outputs or outcomes, adoption by other laboratories, continuation of the exemplar practice, or assignment of dedicated resources.

D. Literature Review

Despite the importance policy makers place on technology transfer at DoD laboratories, the research team found little relevant literature on the topic. The team reviewed academic literature, government reports, and legal documents. The literature

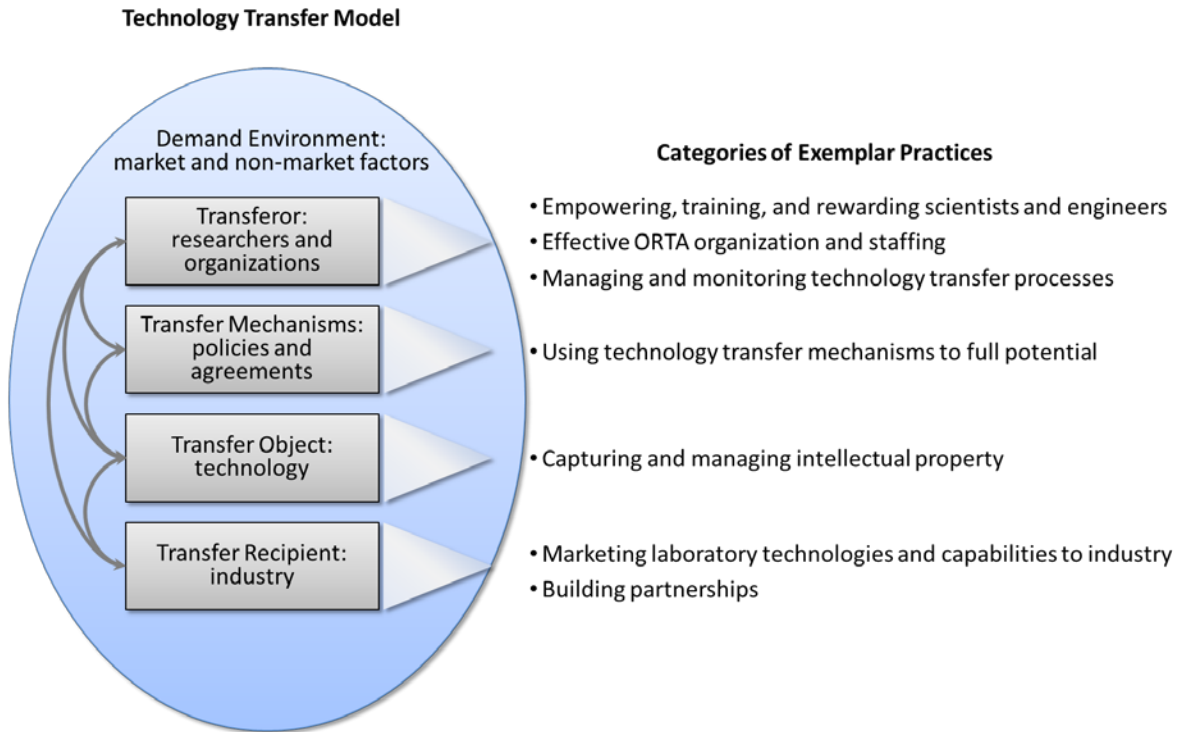
indicates that effective technology transfer is challenging for DoD laboratories and their associated ORTAs for the following reasons:

- Defense laboratories primarily focus on technology transition and view transfer for non-military purposes as secondary (Trexler 2006; Swearingen and Dennis 2009).
- Defense research and development may not be commercially relevant or may be classified (Papadakis 1995; Ham and Mowery 1998).
- Defense inventions may be protected via trade secrets rather than patents (Bellais and Guichard 2006).
- Defense researchers often work on weapon systems, for which performance is the overriding concern, making it difficult to work with industry partners who also must balance schedule and cost (Ham and Mowery 1998).

Rather than specific practices and policies, the literature provided high-level practices in use at DoD laboratories, including:

- Strategically engaging in technology transfer (Trexler 2006; Reed and Nimmo 2001; Ballato and Stern 1999; Ham and Mowery 1998).
- Creating an effective ORTA (Trexler 2006; Ballato and Stern 1999).
- Encouraging, enabling, and rewarding laboratory scientists and engineers to undertake technology transfer (Trexler 2006; Ballato and Stern 1999; Leuthold 1998; Galbraith, Merrill, and Campbell 1991).
- Facilitating technology transfer agreements (Trexler 2006; Ballato and Stern 1999).
- Leveraging other technology transfer resources (Ballato and Stern 1999).

The literature review highlighted several critical factors for a successful technology transfer program, including an effective ORTA, engaged researchers, well-managed intellectual property, using technology transfer mechanisms to their full potential, efficient technology transfer processes, and meaningful interaction with industry through marketing or partnerships (Hughes et al. 2011). The research team organized exemplar practices and policy recommendations around related categories, which correspond to the technology transfer model in Figure 1, adapted from a model proposed by Bozeman (2000). The intellectual property developed by the researcher or government organization (called *transferor*), is captured and transferred to the recipient, such as industry, through various mechanisms, including policies and agreements.



Source: Adapted from Bozeman (2000).

Figure 1. Technology Transfer Model and Categories of Exemplar Practices

Given the lack of literature in this realm, the research team chose interviews with DoD laboratory ORTA staff and other stakeholders as the primary data-collection method.

E. Semi-structured, Chain-Referral Interviews

Between June and September 2012, the research team conducted semi-structured interviews with representatives of 21 DoD and DoD-affiliated laboratory ORTAs and DoD technology transfer coordinating offices; lawyers from 7 DoD legal offices; and 14 other stakeholders, including partnership intermediaries, DoD contractors, DoD laboratory researchers, and technology transfer professionals at the Department of Energy. Interviews with staff from DoD laboratories and legal offices were split across military branches (6 from the Air Force, 11 from the Army, 9 from the Navy, and 2 from DoD headquarters). See Appendix A for a complete list of participating offices and interview dates.

Preliminary interviews with individuals identified by the sponsor and in previous research on technology transfer (Hughes et al. 2011) yielded lists of ORTA and legal office representatives who potentially use technology transfer exemplar practices.

Interviewees also offered policy recommendations. The preliminary interviewee discussion focused on four topics:

1. Current technology transfer exemplar practices
2. Potential technology transfer exemplar practices
3. Potential industry interviewees
4. Policy recommendations affecting technology transfer

The research team then interviewed ORTA and legal office representatives the preliminary interviewees identified and asked them to report exemplar practices and policy recommendations at their laboratories. These discussions focused on six topics:

1. Technology transfer exemplar practices at interviewee's ORTA
2. Technology transfer exemplar practices at other ORTAs
3. General ORTA information, such as number of staff and budget information
4. Potential industry interviewees
5. Potential researcher interviewees
6. Policy recommendations affecting technology transfer

During this second round of discussions, interviewees identified additional ORTA and legal office representatives to interview. Thus, the research team used a chain-referral approach to sampling interviewees (Atkinson and Flint 2001), whereby preliminary interviewees recommended subsequent interviewees.

See Appendix B for the interview guides used for both rounds of discussions.

F. Exemplar Technology Transfer Practices

The research team used a structured method to determine whether practices identified by interviewees should be included in the report as exemplar. Throughout interviews with ORTA and legal office representatives, the research team identified practices that fit one or more of the following criteria:

- Measurable outputs or outcomes; for example:
 - Reduction in number of days to execute agreements
 - Increase in number of agreements
 - Increase in number of agreements with targeted groups (e.g., small businesses)
- Adoption by other laboratories or branches
- Continued implementation of the practice over time

- Assignment of dedicated resources to exemplar practice

Thus, the research team evaluated exemplar practices only from the perspective of ORTA staff or other stakeholders who had identified practices. When there was disagreement on a topic across interviewees, the research team probed for more information to better understand nuances. Practices were not validated by business partners, laboratory leadership, or other stakeholders. Some additional details were provided by news stories and other documents obtained through web searches.

Using these criteria, the research team identified over 20 exemplar practices, which were grouped into seven categories that roughly coincide with the technology transfer model depicted in Figure 1. Table 2 provides the name, description, and reason for including each practice, organized by theme. The table also includes the names of practitioners that use each practice.

G. Report Structure

The remainder of this report presents details about the exemplar practices organized around the seven technology transfer life cycle themes in Table 2:

- Ensuring effective ORTA organization and staffing (Chapter 2)
- Empowering, training, and rewarding researchers (Chapter 3)
- Capturing and managing intellectual property (Chapter 4)
- Using technology transfer mechanisms to their full potential (Chapter 5)
- Managing and monitoring technology transfer processes (Chapter 6)
- Marketing laboratory technologies and capabilities to industry (Chapter 7)
- Building partnerships (Chapter 8)

Chapters 2 through 8 provide details about the practices by theme, including their potential benefits and impediments to their widespread implementation (hereafter referred to as “hurdles”). Given the importance of available resources to implement every practice, the need for resources was not identified as a hurdle unless there was some aspect of the required resources that was particularly noteworthy.

Chapter 9 summarizes the research results and presents conclusions. Appendix A lists participating offices and interview dates, Appendix B presents the interview discussion guides, and Appendix C lists all practices identified in the interviews, including those excluded from the main report.

Table 2. Exemplar Practices for DoD Technology Transfer

Theme	Practice	Description	Criteria for Inclusion	Example Practitioner(s)
Ensuring effective Office of Research and Technology Application (ORTA) organization and staffing	Decentralizing the ORTA organization	Design a decentralized ORTA organized around specific research or industry foci	Continued implementation	Massachusetts Institute of Technology Lincoln Laboratory; Johns Hopkins University Applied Physics Laboratory
	Building relationships between ORTA and general counsel functions	Provide ORTA staff with easy access to and good relationships with attorneys	Continued implementation	Army Armament Research, Development and Engineering Center, Picatinny Arsenal
	Developing grant programs for pilot programs	Provide seed money to ORTA staff for pilot programs or software that may benefit technology transfer	Continued implementation, dedicated resources	Office of Naval Research
Empowering, training, and rewarding researchers	Training researchers about technology transfer	Train scientists and engineers about technology transfer	Continued implementation, adoption by other laboratories	Johns Hopkins University Applied Physics Laboratory
	Recognizing researchers	Recognize researchers via awards	Continued implementation, dedicated resources	Johns Hopkins University Applied Physics Laboratory
		Recognize researchers via larger royalty payments	Continued implementation	Space and Naval Warfare Systems Command, Systems Center Pacific
	Training technology transfer staff about intellectual property issues	Train DoD staff on IP and data rights issues	Continued implementation, adoption by other laboratories	Defense Acquisition University
Capturing and managing intellectual property (IP)	Identifying IP	Use Innovation Discovery Process events where inventors discuss research projects in front of experts who identify IP	Continued implementation, adoption by other laboratories	Naval Surface Warfare Center, Crane Division
		Set up program to examine publications for intellectual property	Continued implementation	Johns Hopkins University Applied Physics Laboratory
		Use TechLink to locate IP in publications	Continued implementation	Air Force Research Laboratory
	Evaluating invention disclosures	Use Review Boards to evaluate IP to determine what to patent	Continued implementation	Aerospace Corporation; Naval Surface Warfare Center, Indian Head Division; Army Medical Research and Materiel Command

Theme	Practice	Description	Criteria for Inclusion	Example Practitioner(s)
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	Joint ownership agreements	Agreement on a strategy for licensing the joint intellectual party to a third party	Continued implementation	Army Research Laboratory
	Limited-purpose and short-form Cooperative Research and Development Agreements (CRADAs)	Use CRADAs for material transfer agreement	Continued implementation	Air Force Research Laboratory, Aerospace Directorate
		Use CRADAs for software use agreement	Continued implementation	Air Force Research Laboratory, Information Directorate
		Use CRADAs for non-disclosure agreement	Continued implementation	Air Force Research Laboratory
	Foreign government CRADAs	Use CRADAs to enter into agreement with foreign government	Continued implementation, adoption by other laboratories	Army Medical Research and Materiel Command
	Facility CRADAs	Use CRADAs that allows DoD contractor to subcontract facility to third parties	Continued implementation	Air Force Applied Neuroscience Branch, 711th Human Performance Wing, Human Effectiveness Directorate
Managing and monitoring technology transfer processes	Changing processes	Standardize processes and procedures to increase efficiency	Measurable outcomes, continued implementation	Army Armament Research, Development and Engineering Center, Picatinny Arsenal
	Tracking CRADAs and licenses	Track licenses and CRADAs	Continued implementation	Space and Naval Warfare Systems Command, Systems Center Pacific
	Streamlining licenses	Edit and cut license agreements	Continued implementation	Army Medical Research and Materiel Command
	Developing handbooks for agreements and contracts	Develop handbook for CRADA partners	Continued implementation	Office of Naval Research
		Develop handbook for licensees	Continued implementation	Aerospace Corporation
	Developing databases and checklists for processes	Develop standard patent royalty distribution processes	Measurable outcomes, continued implementation	Secretary of the Air Force, General Counsel; Air Force Research Laboratory, Partnering Division
		Use software to manage intellectual property	Continued implementation	Naval Research Laboratory
	Checking status of CRADAs	Perform routine status checks on agreements	Continued implementation	Air Force information Operations Center

Theme	Practice	Description	Criteria for Inclusion	Example Practitioner(s)
Marketing laboratory technologies and capabilities to industry	Advertising laboratory technologies	Actively advertise laboratory technologies available for licensing	Continued implementation	Army Medical Research and Materiel Command
	Providing industry training	Brief industry on laboratory technology transfer	Continued implementation	Air Force Aerospace Directorate
	Performing marketing assessments	Perform marketing assessments on laboratory technologies	Measurable outcomes, Continued implementation,	Naval Surface Warfare Center, Crane Division; TechLink
	Conducting technology showcases	Conduct technology showcases where researchers and entrepreneurs can talk	Measurable outcomes, continued implementation	Naval Surface Warfare Center, Indian Head Division
Building partnerships	Using partnership intermediaries to assist in technology transfer type of partnership	Nonprofit Griffiss Institute functions as partnership intermediary, business incubator, and training center	Measurable outcomes, continued implementation, dedicated resources	Air Force Research Laboratory, Information Directorate
	Developing agreements with networks of local and educational partnership intermediaries	Naval Surface Warfare Center, Crane Division, works with partnership network that identifies and markets commercializable technologies	Measurable outcomes, continued implementation,	Naval Surface Warfare Center, Crane Division

2. Ensuring Effective Office of Research and Technology Applications (ORTA) Organization and Staffing

This chapter describes the following exemplar practices related to ORTA organization and staffing that DoD technology transfer offices have established:

- Decentralizing the ORTA by organizing staff by technical subject area or business area
- Building strong relationships between the ORTA function and the general counsel function
- Investing in Navy technology transfer pilot programs

A. Decentralizing the ORTA Organization

Decentralized staff and localized control enable ORTA staff to make quick decisions. They also allow the office to attract experienced staff. Furthermore, these practices can accelerate decisions and keep lines of communication open. However, some laboratories may not have sufficient staff to act as liaison between the laboratory units and the technology transfer office.

Example 1. ORTA organization by discipline areas

The *Technology Licensing Office* (TLO) is the technology transfer office for both Massachusetts Institute of Technology (MIT) and MIT Lincoln Laboratory (MIT-LL), an Air Force FFRDC. TLO staff handles invention disclosures, patenting, licensing, and compliance issues for MIT-LL.

The TLO uses a decentralized staffing structure and streamlined methods for technology transfer. The TLO has about 10 licensing officers who cover all technologies handled at MIT and MIT-LL.³ These include technologies related to biotechnology, biological sciences (e.g., cell biology, diagnostics, mouse models, medicine and mechanical devices), computer sciences (e.g., software, algorithms, digital imaging, and video games), clean and renewable energy (e.g., photonics, chemicals and advanced materials), aerospace, and industrial products.

³ See description of staff at http://web.mit.edu/tlo/www/about/our_staff.html.

Most TLO staff members have at least 10 years of experience in the private sector. Invention disclosures are assigned to the TLO licensing officer that has the relevant technical background or already has a working relationship with the researcher or principal investigator reporting the invention.

The decision to patent is made by the licensing officer after talking to the inventor; there is no review beyond that. The licensing officer then engages the patent attorney who prepares the patent application. The same officer is responsible for licensing that patent once the application is approved. Licensing officers seek each other's advice in the office, but ultimately are able to make their own decisions.

In keeping with this autonomy, the TLO staff contracts with patent attorneys when the need arises and occasionally interacts with the MIT Office of General Counsel. The MIT Office of General Counsel is not responsible for oversight of the TLO, nor is it involved with license decisions or the execution of patent agreements.

To keep procedures simple, the TLO accepts disclosures using a simple Technology Disclosure form to which may be attached a technology description (e.g., dissertation cover sheet or some other format). Other than the information called for in the Technology Disclosure form, there are no formalized processes or invention disclosure criteria.

This office organization is only possible if there are multiple licensing officers, as there are for the TLO shared by MIT and MIT-LL. Since many other DoD laboratories may have only a few individuals in their technology transfer offices (and may not have access to a university technology transfer office), this organizational structure may not work for all DoD laboratories. *[Contact information can be found at the MIT Lincoln Laboratory Technology Transfer Patent information website: <http://www.ll.mit.edu/about/TechTransfer/patentsarchive.html>.]*

Example 2. ORTA organization by laboratory business areas

Rather than organize by technical subject area, Johns Hopkins University Applied Physics Laboratory (JHU-APL) Office of Technology Transfer created a Business Area Technology Transfer Team comprising a representative from each of the business areas in the laboratory, a UARC for the Navy. These business areas are:

- Air and missile defense
- Civil space
- Cyber operations
- Homeland protection
- National security analysis

- National security space
- Precision engagement
- Research and exploratory development
- Special operations
- Strategic systems
- Undersea warfare

The Business Area Technology Transfer Team is composed of high-level staff members who serve as a communication link between their business area in the laboratory and the ORTA. This helps ensure that the business area management and inventors are kept in the loop and can assess whether licensing or some other technology transfer mechanism would be appropriate. The primary rationale is to respond efficiently and effectively to technology transfer issues, including requests from the private sector to license technologies. In the licensing example, the team talks to management to assess if there is a potential organizational conflict-of-interest or other laboratory concern. If there are no issues, then the Office of Technology Transfer proceeds to put the license in place. *[Contact: Norma Lee Todd, Technology Transfer Supervisor, Norma.Lee.Todd@jhuapl.edu; techtransfer@jhuapl.edu, 443-778-4528]*

B. Building Relationships between ORTA and General Counsel Functions

Researchers and technology transfer staff with easy access to attorneys can engage in quick conversations to assess the viability of patenting a technology or setting up a CRADA. Such communication also helps to smooth and accelerate the process once a decision is made to file an invention disclosure, patent a technology, or put a CRADA (or other type of agreement) in place. Access to both IP attorneys and contract attorneys is important, depending on the nature of the technology transfer mechanism used. Benefits are enhanced when patent attorneys and researchers are located geographically close, such as on the same post. Technology transfer offices that contract with patent attorneys on an as-needed basis may not be able to maintain close relationships.

Example 1. ORTA and general counsel working relationship

At the U.S. Army's Armament Research, Development and Engineering Center (ARDEC) headquartered at Picatinny Arsenal, the technology transfer office has developed a good relationship with the Chief Counsel's office. This relationship ensures that the technology transfer staff talks to the appropriate attorneys to garner legal advice (e.g., IP attorneys for patent work and business/contract attorneys for technology transfer contracts such as CRADAs). Such communication is especially

important when the CRADAs are linked to acquisition strategies. By regularly talking to the right kind of attorney, the technology transfer staff can make optimal decisions. [Contact: Tim Ryan, Chief, Technology Transfer and International Cooperation, U.S. Army ARDEC, Timothy.s.ryan.civ@mail.mil, 973-724-7953, <https://www.pica.army.mil/TechTran/policy/index.asp#1>]

C. Developing Grant Programs for Pilot Programs

Providing seed money to ORTA representatives at designated Navy laboratories allows the laboratories to create and test innovative processes and software that may benefit the technology transfer and Navy research and development communities. If adopted by other laboratories, benefits could include increased visibility of technology transfer and laboratory leadership. Hurdles include the difficulties of transitioning successful practices to other laboratories.

Example 1. Funding of experimental technology transfer pilot projects

Since approximately 2005, the Department of Navy (DoN) Technology Transfer Program Office has funded various Navy laboratories to conduct pilot projects of new technology transfer approaches. The funding amounts vary from \$5,000 and \$50,000 for each project. Navy laboratories compete for the funding by submitting ideas to the DoN Technology Transfer Program Office. Examples of pilot programs that the DoN Technology Transfer Program Office has funded are: (1) the Innovation Discovery Process at the Naval Surface Warfare Center (NSWC), Crane Division (NSWC Crane); (2) the Military to Market program at NSWC Crane; and (3) evaluation of the Innography patent prioritization software at Space and Naval Warfare Systems Command (SPAWAR) Systems Center Pacific and other Navy laboratories. The first two examples are described in more detail elsewhere in this report.⁴ [Contact: Dorothy Vincent, Office of Naval Research, Technology Transfer, dorothy.vincent@navy.mil, 703-696-4792]

D. Additional Practices

Additional practices to create effective ORTA organizations and staffing were identified during this research:

- Using a committee of ORTA staff members, business representatives, and a science director to discuss current agreements and requests for partnering
- Using at least one full-time professional and one full-time administrator dedicated to technology transfer

⁴ The Innovation Discovery Process is described in Chapter 4, Section A (example 1) and the Military to Market program is described in Chapter 7, Section C (example 1).

- Hiring ORTA staff with private sector experience
- Encouraging membership in technology transfer professional organizations, such as the Association of University Technology Managers (AUTM)

3. Empowering, Training, and Rewarding Researchers

To encourage and empower scientists and engineers to pursue technology transfer, DoD laboratories train and reward staff through the following practices:

- Training researchers about technology transfer mechanisms, how to work with companies, and the process of transferring inventions from the laboratory to the marketplace
- Recognizing researchers for their efforts to bring technologies to market
- Training technology transfer staff about intellectual property and acquisition issues

A. Training Researchers about Technology Transfer

Many laboratories offer initial and ongoing training to their researchers about technology transfer. Training sessions commonly walk the researchers through each technology transfer process to prepare them for filing a patent or putting a CRADA in place. Training sessions range from 30 minutes to half a day. Some laboratories offer lunchtime seminars and invite laboratory speakers to share technology transfer practices or industry representatives to discuss industry needs.

The Aerospace Corporation FFRDC, Armament Research, Development and Engineering Center (AMRDEC), and Edgewood Chemical Biological Center (ECBC) offer online training in addition to live classroom training. In addition, some laboratories share training information at the annual meeting of the DoD Technology Transfer Integrated Planning Team (TTIPT).⁵

ORTA personnel are often evaluated on the numbers of training sessions held or researchers trained or on the outcomes that result from these training sessions, such as increased visibility of technology transfer and revenues from licensing patents.

⁵ For more information visit “17th DoD TTIPT Workshop, October 22, 2012”: <https://ttiip.c2s2.1-3com.com/home.html>.

Example 1. Seminars for entrepreneurs

Using an idea borrowed from university technology transfer offices, such as the Startup Boot Camp at the University of Maryland,⁶ the Johns Hopkins University Applied Physics Laboratory (JHU-APL) ORTA hosted a 3-day series of lunchtime seminars to present materials about resources available to researchers and entrepreneurs. Presentations were made by organizations such as the State of Maryland's Technology Development Corporation (TEDCO), entrepreneurs who licensed technology from JHU-APL, and representatives from local universities who spoke on entrepreneurship. The JHU-APL ORTA has made the session recordings available on its intranet. One spillover benefit is the Entrepreneurship "Community Group," which formed after the boot camp and now meets monthly in person and maintains an online discussion group. The hurdles to implement an entrepreneurship boot camp are scheduling, finding speakers, putting in place the technical functionality to virtually host the event, and advertising the event to ensure attendance by researchers. [Contact: Norma Lee Todd, Technology Transfer Supervisor, Norma.Lee.Todd@jhuapl.edu; techtransfer@jhuapl.edu, 443-778-4528]

B. Recognizing Researchers for Their Efforts

Recognizing researchers for technology transfer activities encourages them to continue to seek out opportunities to transfer technology to the market. In addition, it raises the visibility of technology transfer to other researchers, which may encourage them to participate in technology transfer activities as well. At the same time, learning about industry needs may inspire researchers to envision commercialization possibilities for their technologies.⁷

Some laboratories publicly acknowledge researchers who file patents, work with companies through CRADAs, and participate in technology transfer activities. Other laboratories provide a plaque and recognition to motivate researchers to file patents and similar applications. For example, JHU-APL has separate awards by category, such as a Copyright Award and Invention of the Year award.⁸ The recipients receive a trophy and

⁶ For example, see www.bootcamp.umd.edu.

⁷ For more information visit "Innovation Lunchbox events" at http://www.jhuapl.edu/ott/newsevents/events/InnLnchbx/IL_upcoming.asp.

⁸ Selection of the Invention of the Year award is described on the JHU-APL website as follows:

Each year the JHU APL Office of Technology Transfer and the Office of Patent Counsel assemble an independent review panel to select winners from the hundreds of inventions representing the work of the past calendar year. The winning technologies are selected and celebrated based on their likely benefit to society, improvement over existing technology and commercial potential. Trophies and cash awards are presented to the winning inventors. There are also special awards granted for innovative contributions in different areas.

See JHU-APL's website for a list of winners at <http://www.jhuapl.edu/ott/NewsEvents/IOY/default.asp>.

cash. Some laboratories also provide cash awards for filing an invention disclosure or patent.⁹

In an era of declining resources, rewarding researchers with cash awards may become increasingly difficult. However, researchers can still be honored with a plaque given at an award ceremony, and some researchers have said that the plaque is important to them as recognition for their efforts.

Providing awards for technology transfer requires a system to track invention disclosures, patent filings, licensing income, CRADAS, and other forms of technology transfer. In addition, giving awards requires financial resources and time. These hurdles can be overcome if the laboratory director actively supports technology transfer and ensures that there is financial support for technology transfer activities and recognition.

Example 1. Innovation exchange events for recognizing researchers

JHU-APL honors researchers one to three times per year by hosting Innovation Exchange Events. Technology transfer awards and plaques are given for patents and other technology transfer activities. Executive-level speakers from such companies as Amazon, Discovery Studios, Google, Under Armour, McCormick, and Cisco are invited to speak to researchers about innovation, how they manage it, and industry needs. In 2010 and 2011, JHU-APL's Office of Technology Transfer held three Innovation Exchange Events and four other inventor engagement and recognition programs, which were attended by more than 1,100 staff members from all areas of the organization. *[Contact: Norma Lee Todd, Technology Transfer Supervisor, Norma.Lee.Todd@jhuapl.edu; techtransfer@jhuapl.edu, 443-778-4528]*

Example 2. Royalty-sharing and incentive awards

DoD laboratories provide incentives to file invention disclosures and patent applications. For example, Space and Naval Warfare Command (SPAWAR) Systems Center Pacific provides incentive awards of \$250 for an authorized invention disclosure, \$500 for a filed patent application, and \$1,000 for an issued patent.

By law, laboratories are required to share royalties from patents. The percentages of royalties given to researchers range from 20 percent to 40 percent at SPAWAR Systems Center Pacific.¹⁰ Most DoD laboratories follow a DoD instruction recommending that each inventor or group of inventors receive the first \$2,000 plus 20 percent of the

⁹ Government-owned, government-operated (GOGO) laboratories are limited to giving a researcher a maximum of two \$500 cash awards (up to \$1,000 per year), although some GOGO laboratories make use of other award programs to reward researchers.

¹⁰ SPAWAR Systems Center Pacific provides 40 percent to SPAWAR Systems Center Pacific inventors and 20 percent to all others (e.g., contractors, CRADA partners, and other government inventors).

remainder of the royalties or other payments, up to the legal cap of \$150,000 per year. Some DoD laboratories (such as SPAWAR Systems Center Pacific) go beyond the instruction, and others offer the minimum required by the DoD.

Table 3 lists the percentage royalty paid to inventors at several laboratories whose staffs were interviewed for this assessment. Royalty percentages range from 20 to 40 percent, with SPAWAR Systems Center Pacific being the only government-owned, government-operated laboratory to report more than 20 percent. [Contact: Brian Suh; Technology Transfer Office, SPAWAR Systems Center Pacific; brian.suh@navy.mil; 619-553-5118]

Table 3. Comparison of Inventor Royalty Payouts

Affiliation	Percentage Royalty Payment to Inventor(s)
Army	
Armament Research, Development and Engineering Center (AMRDEC)	20
Army Medical Research and Materiel Command (AMRMC)	20
Army Research Laboratory (ARL) Technology Transfer Office	20
Armament Research, Development and Engineering Center (ARDEC) Picatinny Arsenal	20 ^a
Air Force	
Air Force Research Laboratory (AFRL)	20
Navy	
Naval Surface Warfare Center (NSWC), Crane Division	20
NSWC, Indian Head Division	20 ^b
SPAWAR Systems Center Pacific	40 ^c
University Affiliated Research Center	
Johns Hopkins University Applied Physics laboratory (JHU-APL)	30

^a Leftover income is reinvested to bring in research projects and staff.

^b ORTA would like to increase to 30%.

^c Contractors that are co-inventors get 20%.

C. Training Technology Transfer Staff about Intellectual Property Issues

Understanding the U.S. Government's license rights when it comes to data is important for ORTA staff members who are involved in preparing CRADA agreements. These license rights and other intellectual property issues are not well understood by many in the DoD technology transfer community, and ORTA personnel may not be aware of the availability of training.

Example 1. IP and data rights course for technology transfer professionals

The Defense Acquisition University (DAU) training module called “Intellectual Property and Data Rights” provides information about the Defense Federal Acquisition Regulation Supplement and the importance to the government of obtaining its data rights up front when working with industry.¹¹ This particular training module was edited by DoD data rights attorneys who are experts on this topic, and the module was released in June 2012. It is described as follows:

This (new) module provides fundamental information about intellectual property and the effective management of rights in technical data and computer software and their contribution to programmatic success. The module addresses concepts and legal guidance related to intellectual property, focusing on the rights in technical data and computer software that are the concerns of the Government and of our defense contractors. This module is primarily intended for technology managers and other acquisition professionals who are charged with ensuring that the DoD has the legal rights to the intellectual property necessary to provide the best technology to our warfighters.¹²

The module takes approximately 4 hours to complete, and members of the defense acquisition workforce can earn up to four continuous learning points. There is no tuition cost for either government or industry personnel who directly support the DoD.

Training on the DAU website reaches all DoD staff members with a need to understand the government’s data rights and the acquisition process. The DAU courses are carefully prepared and edited by experts. *[Contact information: Jane Barrow, Associate Counsel, Office of Counsel, Naval Sea Systems Command, jane.barrow@navy.mil, 202-781-3095]*

D. Additional Practices

Additional practices to empower, train, and reward scientists and engineers identified during this assessment are as follows.

- Invention disclosure training for researchers
- Training to teach researchers how to develop partnerships
- IP mining events to increase invention disclosures

¹¹ CLE 068 Intellectual Property and Data Rights:
http://icatalog.dau.mil/onlinecatalog/courses.aspx?crs_id=1911.

¹² New Intellectual Property and Data Rights Training:
<https://dap.dau.mil/career/log/blogs/archive/2012/06/18/new-intellectual-property-and-data-rights-training.aspx>

4. Capturing and Managing Intellectual Property

DoD laboratories have developed the following ways to capture and manage intellectual property (IP):

- Identifying IP during research and development phases
- Evaluating invention disclosures for licensing or commercialization

A. Identifying Intellectual Property

Laboratory staff usually identifies IP so it can be documented in the form of invention disclosures and provided appropriate protection in the form of patents and copyrights. Identification of IP may take place at many levels, including identification of IP by the inventor or identification of IP from a database or research portfolio. According to Federal Laboratory Consortium for Technology Transfer (FLC) report, other ways to identify inventions can include (FLC 2011, 20–21):

- Talking frequently with researchers
- Reviewing patent applications
- Reading reports of research and development results in the laboratory
- Accessing databases of experts and areas of expertise
- Tracking funding and media/web coverage of the laboratory
- Attending program reviews and strategic planning sessions
- Making people aware of the technology transfer office and its role

Some researchers do not think that their discovery is patentable and do not want to file an invention disclosure. However, interactions between the technology transfer office and the researcher can help to identify novel inventions. According to the same FLC report (FLC 2011, 21)

A critical phase in the technology transfer process is the formal assessment of which technologies in the laboratory have transfer potential and the types of resources available at that facility for technology transfer. An assessment of laboratory technologies and resources can be conducted internally by laboratory personnel, externally by outside sources for a fee, or a combination of both.

Other researchers are unable to find the time to complete the paperwork. Additional education and funding for submission processing may ease these concerns.

Example 1. Innovation discovery and mining

NSWC, Crane Division, implemented the Innovation Discovery Process to help researchers identify potential IP. The Innovation Discovery Process involves “Innovation Mining” events where inventors discuss their research projects in front of business and engineering faculty, entrepreneurs, and industry and technology transfer experts who help identify potential invention disclosures and commercialization ideas concurrently. Two employees of the University of Southern Indiana’s Center for Applied Research developed the process with NSWC Crane. Their efforts were funded by the Navy Pilot Program.¹³ Since then, NSWC Crane has hosted five Innovation Mining events, and other Navy and Air Force laboratories have hosted their own events. In particular, the Navy has funded the effort for roll out across its laboratories in FY 2013.

NSWC Crane evaluates the success of Innovation Mining events using counts of potential invention disclosures, potential commercialization ideas, completed and submitted disclosures post-event, inventors trained about IP, and partners exposed to NSWC Crane through participation in the events.

The Innovation Discovery Process is available from NSWC Crane, so associated costs relate mainly to hosting Innovation Mining events. Events necessitate a facilitator, which is estimated to cost between \$2,000 and \$5,000 per event. Inventors may also need funding to attend the events. [Contact: John Dement; Office of Research and Technology Applications/Technology Transfer, NSWC, Crane Division; john.dement@navy.mil; 812-854-4164]

Example 2. ORTA administrative staff assistance with invention tracking and disclosing

The JHU-APL Office of Technology Transfer has an IP capture program to seek out discoveries that should be disclosed. To implement the program, a non-technical administrative staff member was trained to review the *Johns Hopkins APL Technical Digest*¹⁴ and other publications to identify research with potential IP. Office of Technology Transfer staff also reads the internal laboratory blog, COOLER, and attends project reviews to see what researchers were talking about and working on. If research

¹³ In 2009, the Center for Applied Research received the Federal Laboratory Consortium Midwest Region Partnership Award for the development of the Innovation Discovery Process. See https://www.usi.edu/newsinfo/release/press_detail.asp?num=3223. See Chapter 2, Section C, for more information on the Department of Navy Technology Transfer Pilot Program.

¹⁴ Available online from JHU-APL at <http://techdigest.jhuapl.edu/>.

reveals a technology that needs to be documented, Office of Technology Transfer staff checks to see if an invention disclosure has been filed. If not, staff sends an email to the researcher and follows up by telephone. Use of standardized email messages and telephone scripts helps to ensure that the message is clear and all relevant information is collected from the inventor.

The steps in the JHU-APL process follows:

Step 1: Triage material

Scan for keywords and indicators that novel APL IP is being discussed

New, improved, state of the art, revolutionary, better, faster, cheaper,
iteratively developed, prototype, adapted

Keywords that indicate NOT novel

Experiments, field testing, validation, design of experiment, assessment

Step 2: Determine status of IP—Has it been disclosed?

If YES

Confirm with inventor

Attach the material to the case in the database

Mark its release status (public/proprietary)

Notify tech manager of new material

If NO or NOT SURE

Add to source/tracking matrix

Go to Step 3

Step 3: Email Inventors for one of five outcomes (use “scripted” emails)

A. Confirm NEW IP, provide education, capture

Document IP on IP Disclosure Form

Add material to database, marking release status

B. Associate with previous disclosure

Add material to database, marking release status

Notify Tech Manager

C. Address if categorized as “Not IP”

Educate using standard explanatory emails and telephone scripts as needed
on the following:

IP

publications/patent bars

disclosure process

Involve Tech manager as needed

Go to A or B above, as appropriate

D. No response

Resend up to 3 times over 3 weeks, then no further action

E. Negative response

Elevate to technology manager

No further action

The administrative staff person spends about 4 hours a week on the task, and a technical manager from the JHU-APL Office of Technology Transfer works closely with this person. JHU-APL provides a charge code for up to an hour for the researcher to fill out the invention disclosure.

Since the program started, the number of invention disclosures filed has almost doubled each year (on average). About 30 percent of the increase is the result of the administrative review, and the balance is the result of increased interactions of the Office of Technology Transfer technology managers with the researchers. This program has increased the pool of inventions available to patent, market, and license. Because JHU-APL has a fixed patent budget, the program has not increased the number of patent applications; it has increased the number of invention disclosures available for patent, which is expected to enhance the quality of the resulting patents. [Contact: Norma Lee Todd, Technology Transfer Supervisor, Norma.Lee.Todd@jhuapl.edu; techtransfer@jhuapl.edu, 443-778-4528]

Example 3. Publication database searches and follow-up

TechLink staff members undertook a process for the Air Force Research Laboratory in which they reviewed published peer-reviewed technical articles to locate technologies that were potentially patentable.¹⁵ Two TechLink employees culled through three publication databases in the span of 2 years and identified nearly 2,500 technical publications by Air Force employees. They then reviewed these publications, finding that

¹⁵ TechLink is a national partnership intermediary that supports the DoD's efforts to commercialize leading-edge new technology by partnering DoD laboratories with private sector companies for technology licensing, transfer, and research and development. For more information on partnership intermediaries, see Chapter 8, Sections A and B.

approximately 15 percent of the technologies described disclosed reasonably broad-based, innovative ideas that were potential candidates for patenting. Next, the TechLink representatives went to the Air Force patent office counsel to see if the inventors had submitted invention disclosures on these technologies. They found that invention disclosures had been submitted on fewer than 15 percent of the identified technologies.

TechLink has followed up with particularly prolific authors that had not previously submitted invention disclosures to educate them about the desirability of patents and the importance of patents to the technology transfer process.

TechLink employees estimate that their search methodology required a few days to develop, and the publication review process requires about one week of work per 100 publications. The approach necessitates both business and technical expertise. It requires a high level of technical expertise across multiple disciplines or the expertise of multiple individuals coupled with significant experience in both product development and business development. IP expertise is also necessary, but this could be acquired through training if the other background elements are present. [*Contact: Dr. John Dennis, CLP; Senior Technology Manager; MSU TechLink; jdennis@montana.edu; 406-994-7707*]

B. Evaluating Invention Disclosures

Most DoD laboratories undergo some type of IP evaluation to determine what to protect. Many ORTAs use some form of an invention review board process¹⁶ to determine whether to patent technologies from invention disclosures. These committees vary in frequency of meeting, composition of members, and formality of inventor presentations.

Sometimes review boards evaluate invention disclosures solely from a technical angle. Reviews are of limited utility unless they engage individuals that have familiarity or expertise with military uses and industry partners associated with the related technology. Ideally, industry expertise stems from a current partner. In cases where the laboratories develop the technologies themselves, these experts could be ORTA employees with industry expertise or other external laboratory partners and stakeholders, such as partnership intermediaries, venture capitalists, MBA students, or industry experts.

Invention review boards offer several benefits. Review boards prioritize patent applications with military or commercial applications. They can also save time by determining which invention disclosures do not have military or commercial potential.

¹⁶ The invention review board process should not be confused with the marketing plan for the invention, which the government currently requires all applicants to prepare before granting licenses (37 CFR 404.7).

Decisions made by inventors with committee members may necessitate buy-in from laboratory leadership. This places a time burden that increases with frequency of meetings and depth of reviews. Some laboratories expressed that review boards may end up evaluating inventions based on money available to patent rather than on the existence of a technology and associated market.

Example 1. Committees to review invention disclosures for patent potential

The Aerospace Corporation, which manages an FFRDC, uses a patent review committee that meets at least every 6 weeks to determine which invention disclosures to patent. Aerospace has four standing patent review committees based on technology type: physics, electronics, applied mechanics, and systems. The Executive Council appoints the committee members who are senior technical staff members. Researchers must present to the committee each time they formally disclose an invention, and presentations follow a template, which includes information such as motivation, fundamental discriminators, advantages over alternatives, and current status of the technology. Prior to each presentation, the committee members are sent a commercialization assessment form and presentation template. The committee then meets to vote on whether patents should be filed on an invention-by-invention basis. When necessary, the committee may obtain a novelty search¹⁷ or opinions of outside experts. *[Contact: Andrew Quintero, Principal Director, Technology Transfer and Commercialization, The Aerospace Corporation; Andrew.H.Quintero@aero.org; (310) 336-2843]*

Example 2. ORTA invention evaluation board

At least once every 2 months, the ORTA for NSWC, Indian Head Division, convenes its invention evaluation board comprised of a senior scientist, patent attorney, technology transfer staff, and others involved with the research. Each researcher gives a short presentation on his or her invention to the board, and the board decides whether to move forward with a patent. The board accepts about 75 percent of the invention disclosures; the remainder are concepts not deemed patentable. *[Contact: Dr. J. Scott Deiter, Director, Technology Transfer, NSWC, Indian Head Division, john.deiter@navy.mil, 301-744-6111]*

Example 3. Invention review administrator and evaluation committee

AMRMC uses an invention evaluation committee that meets once a month and consists of program managers, technology transfer representatives, and senior personnel

¹⁷ A “novelty search” is a search of prior art that is often conducted by patent attorneys or agents or professional patent searchers before an inventor files a patent application. This search helps an inventor (or review committee) determine whether an invention is novel before resources are committed to obtain a patent.

who have an overall picture of laboratory direction. The AMRMC invention review administrator collects invention disclosures and sends them out for review. The administrator also schedules the committee meetings and communicates with the inventors. AMRMC staff reviews all inventions for military and commercial applicability, with an emphasis on military applications.

Military and commercial applicability are the criteria for an invention's approval, where military application is most important. AMRMC staff would like to involve local venture capitalists and National Institutes of Health experts to help evaluate commercial applications of the technologies under consideration, *[Contact: Paul C. Mele, Ph.D., Director, Office of Research and Technology Applications, AMRMC, Paul.Mele1@us.army.mil]*

C. Additional Practice

The following additional practice for capturing and managing IP was identified during this assessment:

- File a U.S. patent application and, within 12 months, file a Patent Cooperation Treaty (PCT) application at the U.S. Patent and Trademark Office and pay for a new search. With the PCT, a patent can be easily obtained from any other country that is a treaty member.

5. Using Technology Transfer Mechanisms to Their Full Potential

This chapter discusses the technology transfer mechanisms that DoD ORTAs and attorneys have used in creative ways to facilitate technology transfer:

- Invention licensing agreements
- Joint ownership agreements
- Limited Purpose and short-form Cooperative Research and Development Agreements (CRADAs) and short-form CRADAs
- Foreign government CRADAs
- Facility CRADAs

A. Invention Licensing Agreements

A 1988 Amendment (Pub. Law 100-519) to the Federal Technology Transfer Act of 1986 (FTTA, Pub. Law 99-502) expanded the authority of laboratory directors to license “inventions made or other intellectual property developed at the laboratory and other inventions or other intellectual property that may be voluntarily assigned to the Government” (15 USC § 3710a(a)(2)). Prior to this amendment, laboratory directors were authorized to license only inventions under the original FTTA language enacted 2 years earlier. The Department of Commerce codified this interpretation to refer to any invention with the potential of being patented or otherwise protected, including computer software and biological materials (37 CFR Part 404). Some DoD laboratories use this interpretation to license government software, engineering drawings, and other works of technology-related authorship, biological materials, prototypes, and know-how (i.e., intellectual assets) in the absence of patent and copyright protection or with limited patent coverage.

Invention licensing agreements are used for two primary reasons. First, they may help transfer technologies that are not patented, such as software. Second, licensing an unpatented invention is less expensive and frequently quicker than licensing a patented invention.

However, not all DoD attorneys agree with the Department of Commerce’s interpretation of licensable inventions, and there are some other issues associated with licensing inventions. First, even though licensing inventions may take less time than

licensing patents, the process may still take too long for software, especially in comparison to the instantaneous protection of a copyright. Second, the negotiated terms of an invention licensing agreement (that is, a license without the prospect of patent and copyright protection to enforce against third parties) may be limited by the willingness of the licensee to pay anything other than a one-time fee and by the laboratory/licensor to enforce downstream payments.

Example 1. Use of Biological Materials Licenses (BMLs)

AMRMC has used BMLs to transfer materials that are not patented. According to AMRMC personnel, the National Institutes of Health frequently uses BMLs based on the invention licensing authority for materials that are not under patent protection but are valuable. AMRMC determined there were thousands of potentially valuable antibodies held by their command, and it was cost prohibitive to file patents on all of them. Using BMLs, AMRMC is able to license these materials to third parties.¹⁸ [*Contact: Paul C. Mele, Ph.D., Director, Office of Research and Technology Applications, USAMRMC, Paul.Mele1@us.army.mil*]

B. Joint Ownership Agreements (JOAs)

Companies or universities can obtain access to patents by licensing them from DoD laboratories. One mechanism that allows them to do this cooperatively is a Joint Ownership Agreement (JOA).

JOAs are set up after a technology is jointly developed with a partner, a university, or private company. The parties agree on a strategy for licensing the joint intellectual property to a third party. One partner typically agrees not to license its portion of the joint IP, providing the opportunity for a de facto exclusive license.

JOAs facilitate the business relationship between a DoD laboratory and its partner and define roles and responsibilities for patenting and commercializing the jointly developed technology. The terms and conditions of a JOA address such issues as patent prosecution, licensing, marketing, and royalty distribution.

Example 1. JOAs for jointly developed IP

The Army Research Laboratory (ARL) has used JOAs for over 5 years, averaging about one JOA a year. The decision to pursue a JOA depends on the immediacy of the value of the technology in the commercial sector. For example, ARL and Drexel University researchers conducted joint research under a Cooperative Agreement (La

¹⁸ For a sample Biological Material License agreement, see <http://technologytransfer.amedd.army.mil/index.cfm?pageID=forms>.

Scala, Sands, and Palmese 2005). Over 7 years, under the Cooperative Agreement, the researchers developed and patented technologies that reduce hazardous air pollutants during the manufacture of resins for composites. The ARL and Drexel University legal and technology transfer offices collaborated to put the JOA in place to define the terms and conditions of patenting and licensing the jointly owned intellectual property.

The JOA gave ARL and Drexel the opportunity to exclusively license the technologies; the government retains the right to use the technology for government purposes. ARL and Drexel agreed that Drexel would be the licensing party, which allowed greater flexibility in licensing the technologies. (ARL 2009, 15) *[Contact: Mike Rausa, U.S. Army Research Laboratory, Technology Transfer Office, 410-278-5028 (APG), 410-278-5820, michael.d.rausa.civ@mail.mil]*

C. Limited Purpose and Short-Form Cooperative Research and Development Agreements (CRADAs)

Based on 15 USC § 3710a authority, DoD laboratories use Limited Purpose CRADAs and short-form CRADAs¹⁹ to collaboratively address technological challenges with private companies and universities and to participate in material or data transfer, material evaluation, and device evaluation agreements. These CRADAs allow a laboratory to pare down a standard CRADA, removing terms that do not apply to the specific purpose.

The primary benefit of these special-purpose CRADAs is that they are faster and easier to execute than regular CRADAs. The Army's short-form CRADAs for material or data transfer, material evaluation, and device evaluation are four pages long, and the Air Force's Limited Purpose CRADAs for software use take minimal time to process. The Army reports that short-form CRADAs provide an additional benefit by giving laboratory directors, who have signatory authority, useful background about private industry interest in laboratory technologies.

Few hurdles are in the way of adopting Limited Purpose CRADAs. Some attorneys question the use of CRADAs for material transfer because it does not involve a collaborative research process and, thus, does not comply with CRADA guidance. However, both the Army and the Air Force use Limited Purpose CRADAs for transferring software, materials, and data, and for material and device evaluations.²⁰ Some laboratories would prefer legislative changes that allow the DoD to enter into

¹⁹ The Air Force and Navy use the term "Limited Purpose CRADAs," whereas the Army refers to them as "short-form CRADAs."

²⁰ Staff of the Office of the General Counsel of the Air Force, in a meeting with legal counsel for the Air Force Material Command and the Air Force Research Laboratory, agreed that Limited Purpose CRADAs are legal instruments for Air Force technology transfer agreements.

material transfer agreements or non-disclosure agreements (NDAs) without using a CRADA.

Example 1. Limited Purpose CRADAs for testing and evaluating samples, specimens, and materials

Since DoD laboratories lack signature authority for a material transfer agreement, many DoD laboratories use Limited Purpose CRADAs to accept samples for testing. The Air Force developed its material transfer agreement Limited Purpose CRADA by examining essential CRADA clauses related to transferring a sample or material. Air Force counsel then worked these essential clauses into an agreement that would protect the needs of a partner and that a laboratory could legally sign. Laboratories use such Limited Purpose CRADAs for a variety of samples, specimens, and materials. For example, the Air Force Research Laboratory Aerospace Systems Directorate uses these agreements to bring in materials for testing and evaluation, and currently has 14 Limited Purpose CRADAs for material transfers that examine fuel technology. Air Force estimates that more than 20 material transfer agreements have been executed in this way each year for the past 7 years. *[Contact: Kristen Schario, Technology Transfer Manager, Aerospace Systems Directorate, Air Force Research Laboratory, kristen.schario@wpafb.af.mil, 937.938.4831]*

Example 2. Software use and feedback agreements

Because protecting software can be difficult, staff of the Air Force Research Laboratory Information Directorate (AFRL/RI) developed a Limited Purpose CRADA for protecting software. The mechanism is intended to provide software to first responders and other interested organizations subject to security restrictions. In exchange, AFRL/RI receives feedback about the software. The software use agreement also acts as a trial usage agreement. If an organization likes the software, a license can be purchased later. The Air Force Office of the General Counsel has approved the use of the Limited Purpose CRADA for software agreements, and AFRL/RI has entered into about a dozen such agreements.²¹ For large or tested software packages, AFRL/RI uses an invention licensing agreement. *[Contact: Franklin E. Hoke, Jr.; Office of Research and Technology Applications, AFRL/RI; franklin.hoke@us.af.mil; 315-330-3470]*

Example 3. Non-Disclosure Agreements (NDAs)

NDAs are used to bridge the gap between the needs of industry to protect their IP and the needs of the scientists to gain access to information. NDAs are often needed on short notice, but the CRADA signature process can be lengthy. As a result, the Air Force

²¹ See <http://www.safgc.hq.af.mil/organizations/gcq/index.asp>.

drafted and approved a memorandum that waived review if the Limited Purpose CRADA NDA contained no substantive changes from a model CRADA agreement. This method allows for expedited signing at the division chief level. All laboratories headquartered at Wright-Patterson Air Force Base have signed and implemented the memorandum. Laboratories may set limitations on Limited Purpose CRADA NDAs. For example, the Air Force limits these agreements to a maximum of one year with no extensions, which forces parties to enter into a full CRADA if they are interested in performing a larger project. The Air Force has executed about a dozen Limited Purpose CRADA NDAs each year for the past 7 years. *[Contact: Charles H. Harris; Director, Intellectual Property Office, Acquisition Law Division (SAF/GCQ), Air Force Office of the General Counsel; charles1.harris@pentagon.af.mil; 703-697-7464]*

D. Foreign Government CRADAs

Prior to development of the foreign government CRADA, laboratories relied on international agreements to perform dual-country research and development, and such agreements often took over a year to establish. Frequently, foreign CRADAs take less than one month to set up. However, not all military departments have adopted the use of foreign CRADAs. When negotiating foreign CRADAs, care must be taken to ensure that an export-controlled technology is not compromised.

Example 1. Foreign government CRADAs

AMRMC counsel deliberated with various DoD officials, the State Department, and U.S. Trade Representative, and eventually received legal approval to perform a CRADA with a foreign government as long as the research did not involve International Traffic in Arms Regulations (ITAR) technologies. These agencies agreed on a distinctive format for foreign CRADAs. AMRMC's security office reviews all work statements. If the technology of interest involves ITAR, an international agreement is used rather than a foreign CRADA. Since then, AMRMC has signed over 30 foreign CRADAs with foreign government entities in over 15 countries. Other Army and Air Force laboratories have also entered into CRADAs with foreign government entities. *[Contact: Paul C. Mele, Ph.D., Director, Office of Research and Technology Applications, USAMRMC, Paul.Mele1@us.army.mil]*

E. Facility CRADAs

Some DoD laboratories have on-site contractors that run specialized research, development, test, and evaluation facilities. A facility CRADA is an agreement between a DoD laboratory and a contractor that allows the contractor use of the specialized facility on behalf of third parties, laboratory mission permitting, without having to obtain a separate DoD laboratory agreement for each use. The DoD laboratory receives a portion

of the money charged to the third party for facility usage, which can then be used for facility maintenance and operations or improving laboratory capabilities.

Facility CRADAs have several benefits related to facility management and future collaborations. The surcharge funding obtained from a facility CRADA is maintained as a reserve balance on the books of the collaborator and, upon mutual agreement of the CRADA parties, applied to maintain the facility and equipment. In some cases, it covers costs of employees who operate the facilities and reimbursements for any government personnel involved in work for a third party. It also contributes to the development of contractor and government employee technical expertise by generating more facility usage. Furthermore, facility CRADAs may also lead to subsequent collaborations.

There are hurdles associated with implementing facility CRADAs. A laboratory must have management support and demonstrate a need for a facility CRADA in order to implement one. Laboratories interested in facility CRADAs must have a contractor supporting their unique test facilities that is willing to manage the facility CRADA and market the facility. These contractors market the government facilities by attending trade shows and industry events and providing information to industry about the opportunities to use DoD laboratory facilities and equipment.

Example 1. Facility CRADAs and workable templates

Over half of the facility CRADAs the Air Force has signed since 2004 are with the Air Force Research Laboratory (AFRL) 711th Human Performance Wing. The Wing has seven facility CRADAs with onsite support contractors and has established a workable template for facility CRADAs. One of these CRADAs involves six to eight in-house test facilities, while another involves test dummy rentals. The cost for subcontracting the facility is marked up to cover the cost of maintenance and equipment in addition to direct costs. The surcharge received by the on-site contractor is placed into a reserve account held by that contractor for later use by the DoD laboratory for the purchase of equipment and laboratory support/maintenance. Each of the facility CRADAs involves multiple projects and a wide array of third parties. [*Contact: James D. Kearns, PhD, Technology Transfer and Domestic Alliances Manager, 711th Human Performance Wing, jim.kearns@wpafb.af.mil, (937) 255-3765*]

F. Additional Practices

The following additional practices involving use of technology transfer mechanisms to their full potential were identified during this assessment:

- Encourage inventors to file trademarkable names with the aim of filing future trademarks related to licensing patent rights.

- Consider use of a technology loan program to share technology developed by a DoD laboratory with other Federal, State, and local organizations, such as local police forces.²²

²² Using technology transfer mechanisms, SPAWAR Systems Center Pacific provides robots to police forces who want to try them out, and NSWCC Crane has a night vision and electro-optics equipment loan program (National Law Enforcement and Corrections Technology Center (NLECTC) 2000).

6. Managing and Monitoring Technology Transfer Processes

This chapter describes the following practices DoD ORTAs and attorneys have developed related to managing and monitoring technology transfer processes:

- Changing processes
- Tracking of agreements and contracts such as licenses and CRADAs
- Streamlining licenses
- Developing handbooks for commonly executed agreements and contracts
- Developing databases and checklists for technology transfer processes
- Checking status of regular CRADAs

A. Changing Processes

Many technology transfer activities can be positively affected by the development of standardized processes and procedures, including streamlined agreements and contracts as well as templates or checklists for agreements and contracts. Some DoD ORTAs have integrated several of these general process changes.

Example 1. Standard operating procedures, templates, and checklists

The U.S. Army Armament Research, Development and Engineering Center (ARDEC), headquartered at Picatinny Arsenal, identified common elements and steps in signing agreements and contracts such as CRADAs. Since 2007, ARDEC staff members have worked to develop standard operating procedures, templates, and checklists that enable them to trace problems back to a specific aspect of an agreement, flag projects that need support, and accelerate time to agreement. For these efforts, ARDEC became the first DoD organization to win the Malcolm Baldrige National Quality Award for quality and organizational performance excellence.²³ ARDEC was also cited at the 2011 Army Lean/Six Sigma Excellence Awards Program for demonstrating “excellence in the building, sustainment, and use of continuous process improvement.”²⁴ [*Contact: Tim Ryan, Chief, Technology Transfer &*

²³ See <http://www.pica.army.mil/picatinnypublic/organizations/ardec/baldrige.asp> for more information.

²⁴ See <http://www.pica.army.mil/picatinnypublic/highlights/archive/2011/12-21-11.asp>.

International Cooperation U.S. Army ARDEC, Timothy.s.ryan.civ@mail.mil, 973-724-7953, <https://www.pica.army.mil/TechTran/policy/index.asp#1>]

B. Tracking Agreements and Contracts

Beyond the initial execution of a license or CRADA, it is difficult to track what happens to a technology. One way to monitor technology transfer agreements and contracts is by tracking licenses and CRADAs through checklists of questions. However, the challenge is to follow-up to obtain the needed information from licensees and CRADA partners.

Example 1. Standardized questions in CRADAs and licenses

An October 2011 Presidential memorandum on technology transfer (Presidential Memorandum 2011) elevated the need to better understand technology transfer outputs and outcomes. To track the results of licenses and CRADAs, the SPAWAR Systems Center Pacific ORTA added a list of questions to its agreements that the partner is responsible for answering in annual reports. SPAWAR Systems Center Pacific asks standardized questions to all new licensees, including whether they are selling any new products to the government as a direct result of the license. As licenses are updated, this request for information will be included as part of the reporting requirements and tracked. [Contact: *Brian Suh; Technology Transfer Office, SPAWAR Systems Center Pacific; brian.suh@navy.mil; 619-553-5118*]

C. Streamlining Licenses

Streamlining licenses can lead to contracts that are easier to use, resulting in faster processing of agreements. However, developing a streamlined license requires coordination and agreement between legal counsel and ORTA representatives.

Example 1. Standardized online patent license agreement

In 2012, attorneys and ORTA staff at the Army Medical Research and Materiel Command (AMRMC) rewrote the AMRMC standard patent licensing agreement. The previously separate application, term sheet, and license agreement were consolidated into one document. Now, negotiating parties can focus mostly on the front and back pages of the contract to deal with negotiable aspects.

An electronic version of the standardized patent license agreement employs drop-down menus and a welcome screen with information about the process and an introduction on how to use the new electronic features. Where applicable, data entered in one place automatically populates fields elsewhere in the form. References to the Code of

Federal Regulations are hyperlinked to a digital copy of the codified law. The online document also has a reference section, definitions, and a customer feedback option.

As a result of these efficiencies, completing a license agreement takes at least 25 percent less time than it did before. Feedback from AMRMC employees on the new format has been positive. *[Contact: Paul C. Mele, Ph.D., Director, Office of Research and Technology Applications, USAMRMC, Paul.Mele1@us.army.mil]*

D. Developing Handbooks for Agreements and Contracts

Some DoD ORTAs have developed handbooks for commonly executed agreements and contracts, which contain information needed to develop a CRADA or license. One ORTA reported that its handbook has eased the burden of executing CRADAs. Another benefit is that ORTA staff shares these handbooks with potential CRADA partners and licensees who can refer to them for explanations about specific clauses. Staff at one ORTA noted that handbooks lead to smoother execution of agreements, but not necessarily shorter execution times.

Example 1. Navy CRADA Handbook

The Navy CRADA Handbook was developed by the Office of Naval Research (ONR), and the latest release is dated January 2009. This template explains the laws associated with CRADAs and their different sections, and it provides alternative CRADA language and several CRADA templates. *[Contact: Dorothy Vincent, Office of Naval Research, Technology Transfer, dorothy.vincent@navy.mil, 703-696-4792]*

Example 2. Licensing toolkit for potential business partners

The Aerospace Corporation, which manages an FFRDC, developed the Intellectual Property Program Licensing Toolkit. The toolkit includes an initial questionnaire that inquires how the business will use the license; a licensing worksheet that asks for information on execution fees, royalties, and field of use; a standard license agreement; and a license agreement change request that divides the standard license agreement into editable sections. *[Contact: Andrew Quintero, Principal Director, Technology Transfer and Commercialization, The Aerospace Corporation; Andrew.H.Quintero@aero.org; (310) 336-2843]*

E. Developing Databases and Checklists for Processes

Several ORTAs have also used checklists or standardized databases to improve technology transfer processes. ORTAs report that such automated systems cut down the amount of time to manage technology transfer activities such as royalty distribution. In the example below, the Naval Research Laboratory (NRL) reports that the use of a

database provides a simpler, more reliable, and faster way to manage technology transfer activities.

Example 1. Royalty distribution binder with checklist

Staff at the Air Force Office of the General Counsel and the Air Force Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) Program Office standardized the patent royalty distribution process upon realizing they did not have a standardized checklist or template for collecting royalty-related documents. The result was a “royalty distribution binder” used to maintain all Air Force licenses and royalties resulting from these licenses. The Air Force SBIR/SBTT Program Office staff reports that the royalty distribution binder took a year to set up, but cut in half the time required to distribute royalties. *[Contact: David Sikora; Air Force SBIR/STTR Program Manager, Air Force Research Laboratory; David.Sikora@wpafb.af.mil; 937-656-9868]*

Example 2. Technology management software

About 5 years ago, the NRL started using Inteum,²⁵ a commercial software program for managing technology. Inteum was originally designed for universities and is now also used by many companies. The Inteum software tracks licenses and locates agreements using Navy case numbers. It also has a module to track royalty payments and invention disclosures. Additional parts of the software are dedicated to patents and other commonly used mechanisms. NRL reports that its software package cost about \$15,000 to buy, and costs \$3,000 to \$4,000 annually for license renewal, which includes technical support. Other than the technology transfer office head, the ORTA staff was not familiar with Inteum, but found it easy and intuitive to learn. *[Contact: Rita Manak; Head, Technology Transfer Office, Naval Research Laboratory; rita.manak@nrl.navy.mil; 202-767-3083].*

F. Checking Status of CRADAs

In addition to handbooks and databases for tracking IP, some laboratories perform routine status checks on agreements such as CRADAs. Since it can take an average of four months to put a CRADA in place, status checks keep the CRADA process moving and identify barriers or potential roadblocks for CRADAs that are in process. They also help the laboratory commander understand the benefits of the CRADAs for the laboratory.

²⁵ According to “Inteum—Innovative Technology Management,” <http://www.inteum.com/>: “Established in 1992, Inteum has been developing industry-leading Intellectual Property Management software for 20 years.”

Example 1. Reviews of CRADA progress by Technology Transfer Corporate Board

The 688th Information Operations Wing has a Quarterly Technology Transfer Corporate Board that reviews and reports CRADA progress to the Wing Commander. The information in this progress report includes:

- The objective of the CRADA program,
- All CRADAs,
- CRADAs to be reviewed based on their order of execution.

The board meets for an hour each quarter. The board members review CRADAs that are in process and examine information from laboratory and meeting notes and hosted demonstrations. They discuss upcoming CRADAs that are on the horizon and potential CRADA partners, CRADA modifications, as well as terminated CRADAs. The board also reviews sources and distribution of CRADA income. *[Contact: Sally R. Sobey; 688 IOW Technology Transfer Manager, celia.sobey@us.af.mil; (210) 977-5563]*

G. Additional Practices

Other practices to manage and monitor technology transfer processes are as follows:

- Develop screening criteria for CRADAs, i.e. technical, financial, partnership criteria
- Hold regular discussions with licensees, CRADA partners, and other collaborators to ensure common understanding about agreements
- Track all agreements
- Implement invoicing system for license income
- Develop efficiency metrics, such as time to execute a CRADA
- Conduct studies on technology transfer best practices and benchmarking technology transfer metrics

7. Marketing Laboratory Technologies and Capabilities to Industry

DoD laboratories use multiple approaches to market laboratory technologies and capabilities to industry. The exemplar practices described in this chapter are:

- Advertising laboratory technologies
- Providing industry training about technology transfer
- Overseeing marketing assessments
- Conducting technology showcases

A. Advertising Laboratory Technologies

Many laboratories actively advertise laboratory technologies available for licensing. Attending trade shows and other industry events increases communication between DoD laboratories and companies about available technologies from the laboratory and about industry needs.

Example 1. Publicize conference attendance plans and issue “product portfolios”

To make companies aware of their basic research and clinical trials work, the Army Medical Research and Materiel Command (AMRMC) staff regularly attends the Biotechnology Industry Organization (BIO) conference,²⁶ in which about 20,000 members meet every year; and the World’s Best Technologies Innovation Marketplace,²⁷ which has been cohosted by the DoD for a number of years, in addition to other defense-related medical conferences.

To market their technologies, AMRMC staff posts descriptions of technologies on their websites and in a product portfolio. AMRMC has published a 436-page glossy product portfolio that provides abstracts of technologies that are available for licensing. The information is also posted on the AMRMC website by category.²⁸ AMRMC posts an up-to-date list of events that AMRMC staff members plan to attend so that companies can

²⁶ For more information about BIO, see <http://www.bio.org/>.

²⁷ For more information, see <http://www.wbtshowcase.com/>.

²⁸ See http://technologytransfer.amedd.army.mil/assets/docs/marketing/Products_Portfolio_11.pdf.

make plans to talk to the AMRMC staff at those events.²⁹ [Contact: Paul C. Mele, Ph.D., Director, Office of Research and Technology Applications, AMRMC, Paul.Mele1@us.army.mil]

Example 2. Outreach to industry

Other DoD laboratories conduct outreach to industry through presentations at events and meetings. For example, the Army Corps of Engineers Construction Engineering Research Laboratory staff participates in meetings that manufacturers attend; researchers at the Army Research Laboratory hold regular discussions with licensees, CRADA partners, and other collaborators to ensure a common understanding about agreements; and representatives of the Air Force Human Effectiveness Directorate attend trade shows and other industry meetings to showcase facility capabilities. [James D. Kearns, PhD, Technology Transfer and Domestic Alliances Manager, 711th Human Performance Wing, jim.kearns@wpafb.af.mil, (937) 255-3765]

B. Providing Industry Training

Some laboratory ORTAs brief industry on laboratory technology transfer in general. Briefings and training discussions increase industry's awareness about the availability of technologies at laboratories that can be licensed or further developed through CRADAs.

Example 1. Briefing industry at events

The ORTA at the Air Force Aerospace Directorate has prepared a training briefing that staff members present at industry events to make companies aware of technology transfer.³⁰ The briefing discusses the minimum requirements that must be followed and what can be negotiated in executing agreements and what cannot be negotiated. This can help reduce the amount of time necessary to put an agreement in place. The following topics are covered in this briefing:

- Role of ORTAs
- Descriptions of technology transfer mechanisms (e.g., CRADAs, Educational Partnership Agreements, and Commercial Test Agreements)
- Role of partnership intermediary agreement organizations
- Lessons learned

²⁹ See http://technologytransfer.amedd.army.mil/index.cfm?pageID=news_and_events.

³⁰ The same briefing is used for training researchers. See an example of an Air Force Technology Transfer Program presentation at: <http://www.wpafb.af.mil/shared/media/document/AFD-090803-034.pdf>.

- Definitions of proprietary information, restricted access information, protected information, background technology, and special purpose licenses

Preparation of the Air Force Aerospace Systems Directorate briefing evolved over time in response to questions asked by industry. After initial preparation, updates take minimal time. *[Contact: Kristen Schario, Technology Transfer Manager, Aerospace Systems Directorate, Air Force Research Laboratory, kristen.schario@wpafb.af.mil, 937.938.4831]*

C. Overseeing Marketing Assessments

Marketing assessments can also help market laboratory technologies to industry. Working with partnership intermediaries and students at universities leverages ORTA resources and ultimately results in deploying more technologies to the market. In addition, it provides real case studies for students. The key is to develop relationships with universities that have an educational process that can work on laboratory innovations. Once the relationship is established, students can provide additional insights and ideas for commercializing Federal technologies. The commercialization plans developed by students are useful because the information developed by universities can become a “next step” in the process. They can implement their own plans, or provide the information to another university or intermediary for further development. In addition, there are spillover benefits in that networking and showcasing their plans exposes and brands the DoD laboratories as an “innovation” source. NSWC has often received calls after someone attended one of the student presentations and this led to new partnerships with companies.

Example 1. Partnerships with intermediaries for commercialization assistance

NSWC, Crane Division, partners with universities such as Indiana University Law School. Students at such academic institutions are taught to examine patents for patentability and novelty, and also taught the fundamentals of filing for a patent at the U.S. Patent and Trademark Office. After determining the commercial viability of technologies, the students draft invention disclosures or patent applications, including drawings. In addition, NSWC has worked with MBA students and students studying to become entrepreneurs who develop commercialization and market studies based on laboratory-developed technologies.

NSWC Crane has an educational partnership agreement and a partnership intermediary agreement with Ball State University for the Military to Market (M2M) program. The M2M program is a technology transfer program that encourages entrepreneurship students to work with and develop commercial applications using U.S. Navy technologies. Students spend three semesters researching and developing a business plan. The business plans are also entered into and presented at various national and

international business plan competitions. The Indiana State government is interested in creating a foundation to fund development of DoD technologies. The M2M program will be one mechanism for doing this. The funding could be used to implement the needed steps to create a company (e.g., pull together, finance, and launch a management team, and finance and launch the venture). The M2M program was recently selected by *U.S. News & World Report* as one of 10 college classes that impact the outside world (Burnsed 2011). It also won the 2011 Federal Laboratory Consortium (FLC) Midwest Region Partnership Award³¹ and the 2013 FLC Outstanding Technology Transfer Professional Award.³²

Under the guidance of the university faculty and Navy staff, junior year students in the program are given access to government patents and intellectual property and challenged to find commercial opportunities for the technologies. The first step in the process takes place during the students' spring semester when they write commercialization plans for potential businesses based on the military applications they have studied. In their senior year, the students are expected to integrate the technologies into business plans for presentations at national competitions and during E-Day (Evaluation Day) as part of the New Venture Creation course. *[Contact: John Dement; Office of Research and Technology Applications/Technology Transfer, NSWC, Crane Division; john.dement@navy.mil; 812-854-4164]*

Example 2. Screening the U.S. Patent and Trademark Office database for commercial viability of new patents and applications

The DoD-funded partnership intermediary TechLink reviews all the new DoD patents and published patent applications in the U.S. Patent and Trademark Office database on a monthly basis and screens them to identify the innovativeness, reduction to practice, and commercial viability of the technologies. TechLink staff interviews laboratory inventors to better understand the technologies that appear to have the greatest potential for licensing to industry. Through these steps, TechLink narrows the list of patents and published patent applications from about 550 per year to the 75 that it considers the best candidates for licensing to industry. TechLink staff then

- develops commercialization and marketing strategies for each of the selected DoD technologies;
- actively markets these technologies to industry;

³¹ See "2011 FLC Midwest Regional Award Winners," http://www.flcmidwest.org/awards_2011.html for more information.

³² See "2013 FLC Award Winners Announced," <http://www.federallabs.org/awards/>. See <http://www.federallabs.org/recognition/> for more information.

- assists interested companies in evaluating the technologies (for example, by obtaining non-disclosure agreements, material samples, and unpublished data and/or talking to the inventors);
- helps companies develop strong license applications and commercialization plans; and
- conducts other steps in the technology transfer and commercialization processes.

[Contact: Dr. John Dennis, CLP; Senior Technology Manager; MSU TechLink; jdennis@montana.edu; 406-994-7707)]

D. Conducting Technology Showcases

Technology showcases provide an opportunity for laboratory researchers to discuss their technologies with industry researchers and entrepreneurs and for companies to talk directly to inventors “outside the gate.” One measure of this practice’s success is the number of CRADAs and licenses that result from the technology showcases, which is generally about one to three CRADAs or licenses per event. Importantly, the showcases inform companies about the expertise and technologies available at the laboratories, something that is hard to measure, but likely to have longer run effects. Although the partnership intermediary funds the costs of the actual technology showcase, researcher time must still be covered for the preparation and presentation of the posters at the technology showcase.

Indian Head, Crane, and Dahlgren Divisions of NSWC host technology showcases.³³ The Office of Naval Research participates in the Small Business Innovation Research (SBIR) Navy Opportunity Forum each year.³⁴

In another model, TechLink reviews and identifies about 100 patents to market. They provide a marketing/mentoring team to help the inventor prepare a 6-minute PowerPoint pitch that can be presented at a Technology Showcase. TechLink hosted these Technology Showcases from 2004 to 2011. These became the Federal Technology Showcases, which are part of the Federal Laboratory Consortium.³⁵

³³ For information about a showcase to feature NSWC Crane technologies: <http://www.insideindianabusiness.com/newsitem.asp?ID=52803>. Dahlgren Division leaders showcase technologies at Surface Navy Association National Symposium. See <http://www.navsea.navy.mil/nswc/dahlgren/NEWS/SNA/SNA.aspx>.

³⁴ About the Navy Opportunity Forum: <http://www.navyopportunityforum.com/>.

³⁵ “Memorandum of Understanding between the Federal Laboratory Consortium for Technology Transfer and the Maryland Technology Development Corporation,” http://www.federallabs.org/pdf/MOU_TEDCO.pdf. Also see World’s Best Technology Showcase: <http://www.federallabs.org/education/t2trdb/profile/?dm=6&id=579>.

Example 1. Technology showcases

The NSWC, Indian Head Division, has held four technology showcases in 2001, 2003, 2006, and 2009. These events have been co-hosted by a local partnership intermediary, Maryland's Technology Development Corporation (TEDCO).³⁶ For these technology showcases, TEDCO advertised the event, handled registration, and conducted presentations on patent licensing and doing business with laboratories. The inventors (laboratory researchers) present their technologies at poster sessions at each technology showcase. About 12 to 22 technologies are presented at each showcase. These technologies are available for licensing (if patented) or further development in collaboration with the lab through a CRADA. *[Contact: Dr. J. Scott Deiter, Director, Technology Transfer, Naval Surface Warfare Center, Indian Head Division, john.deiter@navy.mil, 301-744-6111]*

E. Additional Practices

The following additional practices for marketing laboratory technologies and capabilities to industry were identified during this assessment:

- Target specific companies for collaborations and inform them of available mechanisms
- Talk to private sector researchers and technology organizations about working with the DoD laboratories and what technology transfer mechanisms are appropriate for different situations
- Meet with SBIR grantees to learn about their needs and culture
- Keep in touch with media to get word out about available technologies
- Cluster patents across services

³⁶ TEDCO Calendar of Events: <http://tedco.md/>.

8. Building Partnerships

This chapter discusses mechanisms DoD laboratories use to form partnerships with outside organizations to accomplish technology transfer. It also describes five types of partners, giving examples mentioned in interviews; lists the functions of partnerships for laboratory ORTAs; and examines two exemplar partnerships in detail.

A. Partnership Mechanisms

Three mechanisms used by DoD laboratories to partner with outside organizations are Partnership Intermediary Agreements (PIAs), Educational Partnership Agreements (EPAs), and Other Transaction Authority (OTA) agreements.

DoD ORTAs commonly use PIAs to “increase the likelihood of success in the conduct of cooperative or joint activities” (15 USC § 3715(a)(1)). Partnership intermediaries are codified in 15 USC § 3715 as follows:

An agency of a State or local government, or a nonprofit entity owned in whole or in part by, chartered by, funded in whole or in part by, or operated in whole or in part by or on behalf of a State or local government, that assists, counsels, advises, evaluates, or otherwise cooperates with small business firms, institutions of higher education.

DoD laboratories use EPAs to partner with educational institutions and nonprofit organizations dedicated to science, technology, engineering, and mathematics education. EPAs exist “for the purpose of encouraging and enhancing study in scientific disciplines at all levels of education” rather than focusing on increasing cooperative research (10 USC § 2194).

OTA agreements have been used by DoD laboratories for a variety of functions, which makes them difficult to classify (Smith, Drezner, and Lachow 2002). At their broadest definition, OTA agreements are used “in carrying out basic, applied, and advanced research projects” (10 USC § 2371).

B. Types of Partnerships

This section discusses five types of DoD laboratory partnerships: national partnership intermediaries, local partnership intermediaries, universities, venture capital organizations, and economic and technology development organizations.

1. National Partnership Intermediaries

DoD began using national partnership intermediaries in 1999. Soon thereafter, it formed the DoD Office of Technology Transfer Partnership Intermediary Network, a network of several national partnership intermediaries that includes TechLink, TechComm, FirstLink, and others.³⁷ The broad role of national partnership intermediaries is to connect laboratories with potential customers and licensees. They also help to identify intellectual property (IP) and execute deals.

Two of the five national partnership intermediaries, TechLink and TechComm, receive congressional funding. TechLink, which became DoD's first PIA in 1999, employs eight technology managers,³⁸ each with at least 10 years of industry experience. Examples of TechLink activities are provided in Chapters 4, Section A (example 3) and Chapter 7, Sections C (example 2).

TechComm signed a PIA with DoD in 2010.³⁹ Although it is funded by Congress, TechComm is in the process of setting up a self-sustaining funding model by soliciting funding from affiliate partners.⁴⁰

2. Local Partnership Intermediaries

Unlike national partnership intermediaries, which help a range of DoD laboratories and businesses, local partnership intermediaries help a specific DoD laboratory or geographic region. Performing the same functions as national partnership intermediaries, local partnership intermediaries tend to work with businesses located near the laboratory they work with. Some local partnership intermediaries are economic or technology development organizations motivated to help local businesses. Examples of local partnership intermediaries include three institutes funded by AFRL: Griffiss Institute, Phillips Technology Institute, and Wright Brothers Institute.⁴¹

³⁷ For a list and description of the partnership intermediaries, see "Department of Defense Partnership Intermediary Agreements, FLC Far West & Mid-Continent Regional Meeting, <http://www.zyn.com/flcfw/05meeting-recap/presentations/Negron.pdf>.

³⁸ TechLink's expertise extends to many industry areas, including advanced materials and nanotechnology, aerospace, construction and environmental technologies, electronics, medical and life sciences technologies, photonics and sensors, and software and information technologies. The company also coordinate with MilTech, to transition innovative technology to DoD operational use, See <http://techlinkcenter.org/about/staff>.

³⁹ TechComm is a coalition of U.S. Federal agencies and their laboratories that works with the Center for Innovation to advance the commercialization of federally funded research. For more information, see <http://thecenterforinnovation.org/?q=techcomm>.

⁴⁰ For a list of current TechComm affiliate partners, see <http://thecenterforinnovation.org/?q=techcomm-affiliates>.

⁴¹ For more information about these organizations, see <http://www.griffissinstitute.org/>, <http://prs.afrl.kirtland.af.mil/PTi/>, and <http://wbi-icc.com/>.

3. Universities

Some DoD laboratories partner with universities, often via EPAs, whose researchers, faculty, and students then perform technology transfer functions for the laboratories. In return, universities benefit from access to laboratory resources and technologies. For example, Naval Surface Warfare Center (NSWC), Crane Division, works with Ball State University to advance the commercialization of laboratory technologies. This partnership is an exemplar practice discussed in Section D of this chapter. Also see Chapter 7, Section C (example 1).

4. Venture Capital Organizations

DoD laboratories tend to partner with venture capital organizations when the technology development strategy involves setting up a start-up company. These venture capital firms identify technologies with commercialization potential, locate potential licensees, facilitate business start-up development, and fund technology development.

5. Economic and Technology Development Organizations

DoD laboratories partner with economic and technology development organizations to locate partners and licensees, develop prototypes, fund startups, and perform other activities that support the mission of the organizations. Laboratories may also use economic and technology development organizations to help fund and organize technology transfer activities and events. For example, NSWC Indian Head has used the Maryland Technology Development Corporation (TEDCO) to help host four technology showcases. See Chapter 7, Section D for more information about technology showcases.

C. Partnership Functions

As indicated in the previous two sections, partnership intermediaries provide DoD laboratories support with various technology transfer activities by performing the following functions:

- Identifying patentable IP
- Writing invention disclosures
- Executing deals such as patents, licenses, and CRADAs
- Developing marketing plans
- Funding technology development and maturation
- Providing seed funding to businesses
- Marketing laboratory technologies
- Running technology showcases

- Connecting laboratories with universities (e.g., students and researchers) and staff of local and national businesses

Table 4 lists partnership types and links them with technology transfer functions that they normally perform. Note that partners may perform functions other than those listed in the table; the table was developed solely from information interviewees provided during interviews for this research.

Table 4. Technology Transfer Functions Performed by Partners

Partner Type	Functions										
	Intellectual Property						Networking				
	Identify IP	Write Invention Disclosures	Execute Deals	Develop Marketing Plans	Provide Maturation Funding	Provide Seed Funding	Market Technologies	Run Technology Showcases	Connect Universities	Connect with Local Businesses	Connect with Large Businesses
National Partnership Intermediaries	X		X	X	X		X	X			X
Local Partnership Intermediaries		X	X	X			X	X	X	X	
Universities	X			X					X	X	
Venture Capital Organizations	X				X	X	X				
Economic and Technology Development Organizations							X	X	X	X	
NIST Manufacturing Extension Partnership							X		X	X	X

D. Partnership Intermediaries as Exemplar Practices

This section provides details about two partnerships highlighted as exemplar practices during interviews with DoD laboratory ORTA staff. The first partnership involves Griffiss Institute, affiliated with Air Force Research Laboratory Information Directorate (AFRL/RI) in Rome, New York. The second involves the NSWC Crane's partnership network.

Example 1. Using partnership intermediaries to assist in technology transfer

New York State created the nonprofit Griffiss Institute in 2002 as a potential partnership intermediary, business incubator, and training center for building upon laboratory technologies developed at AFRL/RI. In February 2011, the Griffiss Institute officially contracted as a partnership intermediary to facilitate the patent process and stimulate innovation within the laboratory. The Griffiss Institute now performs various other technology transfer functions, including conducting patent reviews; drafting and coordinating patent applications; facilitating CRADAs, educational partnership agreements, and commercial test agreements; and broaching small and large businesses and government agencies. Other activities can be added as funding is available.

AFRL/RI uses Griffiss Institute as an “outside the fence” research hub, taking advantage of its networked laboratory. A future upgrade to the network has been funded by a New York State grant to create a high-throughput 1GHZ hub for research, which will be one of six such hubs in the nation.

AFRL/RI evaluates the effectiveness of partnering with Griffiss Institute based on the following metrics: numbers of patent applications filed; numbers of agreements executed (CRADAs, educational partnership agreements, commercial test agreements); numbers of small businesses brought in; and numbers of educational classes, seminars, and workshops conducted. The technology transfer portion of the Griffiss Institute budget was \$300,000 in FY 2012 and will be \$250,000 in FY 2013, a portion of which funds its small staff. *[Contact: Franklin E. Hoke, Jr.; Office of Research and Technology Applications, AFRL/RI; franklin.hoke@us.af.mil; 315-330-3470]*

Example 2. Developing agreements with networks of local and educational partnership intermediaries

NSWC, Crane Division, works with a network of local partnership intermediaries and universities—some under EPAs and some with both EPAs and PIAs. This network has recently been extended to include some out-of-state partners. To date, NSWC Crane has signed 14 PIAs and is in the process of signing 2 more with both in-state and out-of-state partners. Most university network members are business schools, entrepreneurial

centers, or outreach centers based at universities, while local partnership intermediaries include economic development entities from State and local governments.⁴²

NSWC Crane staff works with university partners to identify and market commercializable technologies. Students are introduced to laboratory inventors and technologies and they develop business plans or market analyses. Some students even start their own businesses after graduating, which means they could continue to work with NSWC Crane by licensing technologies and entering into CRADAs. For example, Ball State University hosts the touted Military to Market program, which allows undergraduates in the university's entrepreneurial program to adopt a military technology and build a company before graduating (Burnsed 2011).⁴³ NSWC Crane tracks the outcomes of university partnerships through business plans, counts of licensees, CRADAs, start-ups, and intangible outcomes like earned press and awards.

There are no out-of-pocket costs associated with working with partnership intermediaries and educational partnerships. It is Navy policy to work with partnership intermediaries, but not fund them. The PIA organizations are generally covered by other resources such as State funding, although, in certain circumstances, NSWC Crane has used seed dollars to fund a project or activity resulting from the partnership. *[Contact: John Dement; Office of Research and Technology Applications/Technology Transfer, NSWC, Crane Division; john.dement@navy.mil; 812-854-4164]*

E. Additional Practices

The following additional practices to building partnerships were identified during this research:

- Use TechLink and TechComm to market technologies.
- Partner with nonprofit organizations and State-funded initiatives (e.g., Texas Emerging Technology Fund) to obtain seed and pre-seed funding.
- Partner with a venture accelerator partnership intermediary, such as the GIRVAN Institute of Technology,⁴⁴ that is a spin-out of NASA Ames Research Center.
- Develop prototypes with MilTech, an affiliate of the National Institute of Standards and Technology (NIST) Hollings Manufacturing Extension Partnership (MEP).⁴⁵

⁴² RADIUS is one example of an Indiana economic development center that works with the NSWC Crane laboratory. See <http://www.radiusindiana.com/what-radius-indiana-does> for more information.

⁴³ See Chapter 7, Section C, example 1, for additional information about the Military to Market program.

⁴⁴ See GIRVAN Institute of Technology: <http://www.girvan.org/>.

- Use a mix of contracts (CRADA, test service agreement, and public transaction agreement) with a partnership intermediary to provide more flexibility.

⁴⁵ The NIST Hollings MEP helps small and mid-sized U.S. manufacturers create and retain jobs, increase profits, and save time and money. The nationwide network provides services from innovation strategies to process improvements to green manufacturing. It also works with State and Federal government partners on programs that put manufacturers in position to develop new customers, expand into new markets, and create new products. See <http://www.nist.gov/mep/about.cfm> for more information.

9. Conclusion

This report presents the results of an assessment of exemplar practices recommended by DoD ORTAs and legal staff to meet technology transfer objectives. These exemplar practices were identified through interviews with experts (technology transfer practitioners and stakeholders). Based on these interviews, innovative and creative approaches to technology transfer were identified and documented in this report.

The purpose of this report is to encourage adoption of the exemplar practices it contains by other DoD laboratories with the goal of accelerating the transfer of technological innovations to the marketplace. A second report describes policy issues relevant to technology transfer practices at DoD laboratories and is intended for use by OSD policy makers.

Appendix A

Interview Participants

A broad range of stakeholders in Department of Defense (DoD) technology transfer participated in interviews for this research, including laboratory management and staff, legal counsel, private contractors, and partnership intermediaries. The tables in this appendix provide the names of the offices and organizations that participated and the types (phone or in-person) and dates of interviews.

- Table A-1 lists 21 Office of Research and Technology Applications (ORTAs) and technology transfer coordinating offices throughout the DoD laboratories and research centers (5 from the Air Force, 8 from the Army, 7 from the Navy, and 1 from DoD headquarters).
- Table A-2 names 7 legal offices, including General Counsel offices, throughout DoD (1 legal office in the Air Force, 3 in the Army, 2 in the Navy, and 1 in DoD headquarters).
- Table A-3 provides 2 Department of Energy technology transfer offices that were recommended by interviewees.
- Table A-4 lists 12 other technology transfer stakeholders, including 2 partnership intermediaries, 6 DoD private contractors, and researchers from 4 Federal laboratories and research centers (2 laboratories in the Army and 2 laboratories in the Air Force).

**Table A-1. Offices of Research and Technology Applications (ORTAs) and
Technology Transfer Coordinating Offices**

Organization	Abbreviation	Interview Type	Dates of Interview
Air Force			
Air Force Materiel Command	AFMC	Phone	August 8, 2012
Air Force Medical Service	AFMS	Phone	July 31, 2012; August 8, 2012
Air Force Research Laboratory	AFRL	Phone	June 20, 2012; June 28, 2012; July 2, 2012; August 9, 2012
The Aerospace Corporation ^a	—	In-Person, Phone	July 31, 2012; August 7, 2012
MIT-Lincoln Laboratory/MIT Technology Licensing Office	MIT-LL/MIT TLO	Phone	August 14, 2012
Army			
Army Materiel Command	AMC	Phone	August 10, 2012
Army Research Laboratory	ARL	Phone	August 9, 2012
Aviation and Missile Research Development and Engineering Center	AMRDEC	Phone	August 13, 2012
Edgewood Chemical Biological Center	ECBC	Phone	July 12, 2012
Army Medical Research and Materiel Command	AMRMC	Phone	July 12, 2012; September 6, 2012
Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology	OASA/ALT	Phone	August 2, 2012
Armament Research, Development and Engineering Center, Picatinny Arsenal	ARDEC	Phone	August 2, 2012
Walter Reed Army Institute of Research	WRAIR	Phone	August 7, 2012
Navy			
Johns Hopkins University Applied Research Laboratory ^b	JHU-APL	Phone	August 15, 2012
Naval Research Laboratory	NRL	Phone	September 20, 2012
Naval Surface Warfare Center, Indian Head Division	NSWC Indian Head	Phone	July 26, 2012
Naval Surface Warfare Center, Crane Division	NSWC Crane	Phone	July 11, 2012
Office of Naval Research	ONR	Phone	July 19, 2012; August 9, 2012; August 15, 2012
Space and Naval Warfare Systems Command Systems Center Pacific	SPAWAR Systems Center Pacific	In-Person	August 27, 2012
DoD Headquarters			
Office of the Secretary of Defense	OSD	Phone	June 19, 2012

^a MIT-LL is a Federally Funded Research and Development Center (FFRDC) of the Air Force.

^b JHU-APL is a University Affiliated Research Center (UARC) for the Navy.

Table A-2. Legal Offices

Organization	Abbreviation	Interview Type	Date of Interview
Air Force			
Intellectual Property Office, Office of the General Counsel of the Air Force	SAF/GCQ	Phone	June 20, 2012
Army			
Associate Deputy General Counsel (Acquisition)	—	Phone	July 24, 2012
Legal Office, Armament Research, Development and Engineering Center	ARDEC	Phone	August 20, 2012
Office of the Staff Judge Advocate, Army Medical Research and Materiel Command	ASJA/MRMC	Phone	July 9, 2012
Navy			
Intellectual Property Counsel, Naval Surface Warfare Center	NSWC	Phone	July 17, 2012; July 27, 2012
Office of Counsel, Naval Research Laboratory	—	In-Person	August 13, 2012
DoD Headquarters			
Chairman of the Joint Chiefs of Staff Legal Counsel	CJCS Legal Counsel	Phone	September 19, 2012

Table A-3. Department of Energy

Organization	Abbreviation	Interview Type	Date of Interview
Technology Transfer Coordinator, Department of Energy	—	Phone	August 14, 2012
Technology Transfer Division, Los Alamos National Laboratory	LANL	Phone	August 17, 2012

Table A-4. Partnership Intermediaries, Private Contractors and Researchers.

Organization	Abbreviation	Interview Type	Date of Interview
Partnership Intermediaries			
TechComm	—	Phone	August 17, 2012
TechLink	—	Phone	June 22, 2012; August 7, 2012; August 14, 2012; August 20, 2012
Private Contractors			
Allied Minds Federal Innovations, Inc.	AMFI	Phone	June 14, 2012; June 25, 2012
Boeing (former)	—	Phone	July 20, 2012
Gonsalves Strategies & Solutions, LLC	—	Phone	June 20, 2012
Lockheed Martin	—	Phone	July 9, 2012
Northrop Grumman	—	Phone	June 28, 2012
SAIC	—	Phone	July 10, 2012
Researchers—Air Force			
Air Force Medical Service	AFMS	Phone	August 8, 2012
Air Force Research Laboratory	AFRL	Phone	July 16, 2012
Researchers—Army			
U.S. Army Corps of Engineers	USACE	Phone	August 2, 2012
Natick Soldier Research, Development and Engineering Center	—	Phone	August 27, 2012

Appendix B

Interview Guides

Preliminary Interviewee Guide

The Department of Defense (DoD) asked the Institute for Defense Analyses to conduct an assessment of potential DoD laboratory technology transfer (T2) exemplar practices. You have been identified as someone who is knowledgeable about DoD laboratory T2 in general, and we would like to ask you some questions about exemplar practices that laboratories are currently implementing. Your participation is completely voluntary, and our conversation will be audio-recorded, but if you'd like to tell us something that is off the record, feel free to do so. We will stop recording and writing until you tell us that we can start again.

Introduction

1. Please tell us about yourself.
 - a. What do you do in your current position?
 - b. What is your experience with DoD laboratories?

Exemplar practice

1. Do you know any DoD laboratories that are instituting exemplar practices that could be applied to other DoD laboratories?
 - a. Why do you consider them to be exemplar practices?
 - b. What issues do these exemplar practices address?
 - c. Tell us a little about these practices.
 - d. Do you have contact information for each practice?

Potential Laboratory Exemplar practices

1. In your opinion, are there potential practices that DoD laboratories could implement to better T2?
 - a. Why do you think that this would be a good practice?
 - b. What issues would it address?
 - c. Why hasn't it been implemented, yet?

- d. What barriers are there to implementing such a practice?

Industry

1. Are you familiar with any companies that work particularly well with transferring technology from DoD laboratories to the public sector?
 - a. Why do you consider these companies to work well with laboratories?
 - b. Are any of them using T2 practices that would be useful to other laboratories or researchers?
 - c. Can you provide contact information for these companies?

Policy Changes

1. Are there policy changes including clarifications, or additional legislation or policies that would improve your ability to perform technology transfer?

Misc.

1. Do you know of anyone else that is knowledgeable about DoD laboratories T2 and would be good to interview as an external stakeholder?

ORTA and Legal Representative Interviewee Guide

The Department of Defense (DoD) asked the Institute for Defense Analyses to conduct an assessment of potential DoD laboratory technology transfer (T2) exemplar practices. You have been identified as someone who is instituting unique T2 practices, and we would like to ask you some questions about this exemplar practice. Your participation is completely voluntary, and our conversation will be audio-recorded, but if you'd like to tell us something that is off the record, feel free to do so. We will stop recording and writing until you tell us that we can start again.

Exemplar practice

1. Please list your T2 exemplar practices.
 - a. Which one is most successful and could be applied to other DoD laboratories?
 - b. What issue did this exemplar practice address?
 - c. Why do you consider it an exemplar practice?
2. Tell us about the history of this practice.
 - a. What did you do before you instituted this practice?

- 1) What practice did it replace?
- b. Where did you get the idea?
- c. Did it have a champion?
- d. When did you first implement the practice?
 - 1) How long has the practice been in place?
- e. What were the costs of implementing the practice?
 - 1) How much planning did it take?
 - 2) How much time did it take, and who worked on it?
 - 3) How much money did it cost?
3. Tell us how you implemented the practice.
 - a. Did you use a specific authority?
 - 1) How did you know you had this authority?
 - b. What specific people or offices needed to agree to or support this practice?
 - c. Would it have been easier to implement if something had been different?
4. Tell us about the effects of this practice on T2.
 - a. What have been the outcomes of this practice? (e.g., reduction in number of days to execute; increase in number of agreements)
 - 1) Do you actively track the effects of this practice?
 - 2) How have you tracked the effects of this practice in the past?
 - 3) Has this practices resulted in other related benefits?
 - 4) Have you presented this exemplar practice or written about it? If so, may we have a copy of the slides, documentation, or report?
 - b. Have other laboratories expressed interest in adopting this practice? If so, which ones? Do you recommend that we talk to these laboratories?
 - 1) Would any policy changes need to occur for this practice to be implemented in other DoD laboratories?
 - c. Will you continue to implement this practice?
 - 1) How will you continue to implement this practice?
 - 2) Do you foresee any changes?

Other Exemplar practices

1. Tell us about other people (e.g., researchers, T2 professionals, external organizations) who are instituting T2 exemplar practices.
 - a. Why do you consider this an exemplar practice?
 - b. Do you have contact information for this person or organization?
 - c. Do you work with external organizations, like partnership intermediaries?
 - d. Do any of them use T2 exemplar practices that would be useful to other partners?
 - e. Do you have contact information for these organizations?

General ORTA Information

1. Tell us about ORTA funding
 - a. From what account(s) is your ORTA funded?
 - b. How does it get decided how much the ORTA will be funded at?
 - c. What account(s) does licensing revenue get put into?
 - d. How is any licensing revenue used?
2. Tell us about how the ORTA is involved in other operations.
 - a. Is the ORTA involved in the budgeting process?
 - b. Is the ORTA involved in the strategic planning for the laboratory?
 - c. How is the ORTA involved in the acquisitions process?
3. Tell us about ORTA performance evaluations.
 - a. What metrics is your ORTA evaluated on?
 - b. To whom do you report any T2 successes?
 - c. If you are the only ORTA employees, is T2 success considered in your performance review?
4. Tell us about a little T2 as it relates to scientists and engineers at your laboratory.
 - a. Who determines what amount or percentage researches receive in royalties?
 - b. Do you have access to researchers' performance rating system? Is T2 included in scientists' performance reviews?

Companies

1. Tell us about companies that you work with.
 - a. Do any of them use T2 exemplar practices in their interactions with laboratories, for example novel agreements with laboratories, novel communication with laboratories, or partnership intermediaries?
 - b. Are any of them using innovative T2 practices that would benefit other laboratories or companies?
 - c. Do you have contact information for these companies?

Researchers

1. Tell us about DoD laboratory exemplar practices that relate to researchers, for example training programs, researcher-led activities, or technology evaluation boards.
 - a. Are any of them using T2 exemplar practices that would be useful to other laboratories or researchers?
 - b. Can you provide contact information for these researchers?

Policy Changes

1. Are there other policy changes that would improve your ability to perform technology transfer?

Appendix C

Additional Practice Recommendations

Table C-1. Additional Practice Recommendations

Theme	Practice
Ensuring effective Office of Research and Technology Application (ORTA) organization and staffing	<p>Use committee made of ORTA staff, ORTA business representatives and science director to discuss current agreements and requests for partnering</p> <p>Use of at least one full time professional and one full time administrator dedicated to T2</p> <p>Hire ORTA staff with private sector experience</p> <p>Encourage T2 professionals to join professional organizations such as the Association of University Technology Managers (AUTM)</p>
Empowering, training, and rewarding researchers	<p>Invention disclosure training for researchers</p> <p>Training to teach researchers how to develop partnershipsIP mining events to increase invention disclosures</p>
Capturing and managing intellectual property	<p>File a U.S. patent application and, within 12 months, file a Patent Cooperation Treaty (PCT) application at U.S. Patent and Trademark Office and pay for a new search. Then, take this PCT and go into any other country that is a PCT member and get a patent easily</p>
Using technology transfer mechanisms to their full potential	<p>Encourage inventors to file trademark-able names with the aim of filing future trademarks related to licensing patent rights</p> <p>Consider use of a technology loan program to share technology developed by a DoD laboratory with other Federal, State, and local organizations, such as local police forces</p>
Managing and monitoring technology transfer processes	<p>Develop screening criteria for CRADAs, i.e. technical, financial, partnership criteria</p> <p>Hold regular discussions with licensees, CRADA partners, and other collaborators to ensure common understanding about agreements</p> <p>Track all agreements including funds-in</p> <p>Implement invoicing system for license income</p> <p>Develop efficiency metrics, such as time to execute a CRADA</p> <p>Conduct studies on technology transfer best practices and benchmarking technology transfer metrics</p>
Marketing laboratory technologies and Capabilities to Industry	<p>Target specific companies for collaborations and inform them of available mechanisms</p> <p>Talk to private sector researchers and technology organizations about working with the DoD laboratories and what technology transfer mechanisms are appropriate for different situations</p> <p>Meet with SBIR grantees to learn about their needs and culture</p> <p>Keep in touch with media to get word out about available technologies.</p> <p>Cluster patents across services.</p>

Theme	Practice
Building partnerships	<p>Use TechLink and TechComm to market technologies</p> <p>Partner with nonprofit organizations and State-funded initiatives (e.g., Texas Emerging Technology Fund) to obtain seed and pre-seed funding</p> <p>Partner with a venture accelerator partnership intermediary, such as the GIRVAN Institute of Technology, that is a spin-out of NASA Ames Research Center.</p> <p>Use MilTech, affiliated with the National Institute of Standards and Technology's Manufacturing Extension Partnership to develop prototypes</p> <p>Use a mix of contracts with a partnership intermediary, including a CRADA, test service agreement, and a public transaction agreement to allow for more flexibility</p>

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Abbreviations

AFMC	Air Force Materiel Command
AFMS	Air Force Medical Service
AFRL	Air Force Research Laboratory
AFRL/RI	AFRL Information Directorate
AMC	Army Materiel Command
AMFI	Allied Minds Federal Innovations, Inc.
AMRMC	Army Medical Research and Materiel Command
ARDEC	Armament Research, Development and Engineering Center
ARL	Army Research Laboratory
BML	Biological Material License
CRADA	Cooperative Research and Development Agreement
DAU	Defense Acquisition University
DLO	Defense Laboratory Office
DoD	Department of Defense
DoN	Department of Navy
ECBC	Edgewood Chemical Biological Center
EPA	Educational Partnership Agreement
FFRDC	Federally Funded Research and Development Center
GOGO	Government-Owned, Government-Operated
ITAR	International Traffic in Arms Regulations
IP	Intellectual Property
JHU-APL	Johns Hopkins University Applied Physics Laboratory
JOA	Joint Ownership Agreement
M2M	Military to Market
MBA	Master of Business Administration
MEP	Manufacturing Extension Partnership
MIT-LL	Massachusetts Institute of Technology Lincoln Laboratory
NDA	Non-Disclosure Agreement
NIST	National Institute of Standards and Technology
NRL	Naval Research Laboratory
NSWC	Naval Surface Warfare Center
ONR	Office of Naval Research
ORTA	Office of Research and Technology Applications
OSD	Office of the Secretary of Defense

OTA	Other Transaction Authority
PCT	Patent Cooperation Treaty
PIA	Partnership Intermediary Agreement
R&D	Research and Development
SAF/GCQ	Secretary of the Air Force/General Counsel
SBIR	Small Business Innovation Research
SPAWAR	Space and Naval Warfare Systems Command
STTR	Small Business Technology Transfer
T2	Technology Transfer
TEDCO	Technology Development Corporation
TTIPT	Technology Transfer Integrated Planning Team
UARC	University Affiliated Research Center
WRAIR	Walter Reed Army Institute of Research

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14. ABSTRACT This report discusses exemplar practices recommended by Department of Defense (DoD) laboratory staff, Offices of Research and Technology Applications (ORTAs), DoD legal staff, and other stakeholders to transfer technology from the laboratory to the marketplace. The purpose is to inform staff at DoD laboratories and technology transfer offices about these practices and encourage their adoption across the DoD. Using themes identified in a review of academic literature, government reports, and legal documents on technology transfer, the research team interviewed DoD laboratory ORTA and legal staff and other stakeholders. From the data collected from these interviews, the research team selected 24 practices as exemplar and organized them into the following categories: ensuring effective ORTA organization and staffing; empowering, training, and rewarding scientists and engineers; capturing and managing intellectual property; using technology transfer mechanisms to full potential; managing and monitoring technology transfer processes; marketing laboratory technologies and capabilities to industry; and building partnerships. Many DoD technology transfer organizations have implemented creative approaches within the boundaries of existing regulations, directives, and instructions. The adoption of these exemplar practices is likely to accelerate the transfer of innovations to the marketplace.					
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